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OBSERVATIONS ON THE WATER SNAILS OF MONARO AND NEW ENGLAND, NEW SOUTH WALES, WITH ESPECIAL REFERENCE TO THEIR CERCARIA CARRYING CAPACITY.¹

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(Assisted in technical matters by JOHN GREER),
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THE present communication is largely the outcome of observations made during the months of April, May, June, July and during the first week in August in and around Cooma, Nimmitabel, Bombala, Gungahar River and Adaminaby in Monaro and subsequent confirmatory work done during a tour through New England in August. The work was undertaken as part of an epidemiological study of conditions and circumstances associated or apparently associated with "black disease" in sheep (braxy?).

One of the problems awaiting solution in this connexion is whether or not there is a direct or indirect association between fluke infestation and

"black disease" and therefore, it was early apparent that a study of the distribution of various water snails was of considerable importance as was also the investigation of their cercaria carrying capacities.

It is rather surprising to find that so little has been done in the way of investigation of water snails in this State and that it has never yet apparently been demonstrated which snail was the intermediate host of the sheep fluke in Australia.

Mr. Iredale, of the Australian Museum, tells me that even the classification and nomenclature of Australian water snails is yet in a quite nebulous condition, though the members of the Museum are now working on the subject.

Information bearing on the problem of the means of transmission of sheep fluke in this country is also conspicuous by its practical absence. Cobb in 1897⁽¹⁾ and 1898⁽²⁾ gives some observations which according to him tend to show that a variety of *Bullinus* is the intermediate host of *Distoma hepaticum*. His conclusions are, however, rendered less acceptable by the fact that a drawing made by him and published⁽²⁾ figures a typical *Bullinus* animal

¹ Received for publication on October 2, 1925.

emerging from an equally typical *Limnæa* shell. The only conclusion that seems probable is that he was working with snails of both types and did not sufficiently appreciate the difference between them.

The objects of my principal investigation which was conducted at Cooma, may be grouped under several headings:

1. The varieties of Monaro water snails, their habitat and distribution.
2. General bionomics.
3. The cercaria found in Monaro water snails.
4. The relationship between various snails and fluke.

SPECIES OF WATER SNAILS: THEIR HABITAT AND DISTRIBUTION.

Bullinus Brazieri (Smith).

Description.

The Shell.—The shell is sinistrally coiled, that is to say that viewed from the apex of the spiral the whorls take a direction which is anticlockwise. The longest axis is that from apex to the shell orifice or mouth. The width of the widest part of the whorl is rather greater than half the spiral length. The size varies greatly not only in different localities, but in the same pond or pool and this does not appear to depend entirely on the age of the creature. Specimens up to sixteen millimetres in the spiral axis have been encountered which have a measurement of about ten millimetres across the widest whorl. The mouth of the shell is irregularly oval; the inner lip forms a convexity towards the lumen. This part of the lip is represented by an irregular, elongated, triangular surface which is varyingly roughened on the first whorl of the spiral. The colour of the shell in the living condition varies very considerably and may appear various shades of yellowish brown, brown or black, but the dead, empty shell appears pale yellowish brown. The variation of the colour of the living specimens appears to be dependent on the colour of the mud in the particular situation in which the particular specimens are found, and may be protective in nature. A part of the variation in colour appears certainly to be due to the adherence of particles of mud and the growth of algæ and other water growth.

The Animal.—The animal is distinguished by the possession of certain easily recognizable characteristics. The tentacles are long and are of pale pink or even reddish colour. This red colour may be noticed in the less pigmented parts of the body generally. The colour of the animal is chiefly darkish grey-black, but the extreme edges of the foot,

proboscis and other extremities are more translucent. The eyespots are situated at the junction of the inner and anterior edge of the tentacle and a knob-like triangular area on the proboscis. The proboscis is a more or less quadrilateral expanse anterior to the tentacles which is in most positions convex upwards, and is anteriorly bifurcate by a central notch, while lesser notches divide the lateral lobes. The foot is longer than the shell and is blunt anteriorly and pointed posteriorly. Hæmoglobin is present in the substance of the animal and is liberated when it is injured. It is unnecessary to detail further the structure of the animal, as the above facts are sufficient taken in connexion with the data shown in the drawings to enable easy recognition of the creature.

Habitat and Distribution.

The specimens of *Bullinus brazieri* dealt with in this report were obtained chiefly in areas round Cooma and Berridale. A few were encountered in creeks in the Bombala neighbourhood (July). None were found during the examination of a number of

swamps and a few creeks in the mountain region in the neighbourhood of the Gungahland River (May). This species was often found in relatively deep water (a foot or more), in ponds and in slow running creeks or in the quiet pools in connexion with faster running streams and were occasionally encountered in association with far greater

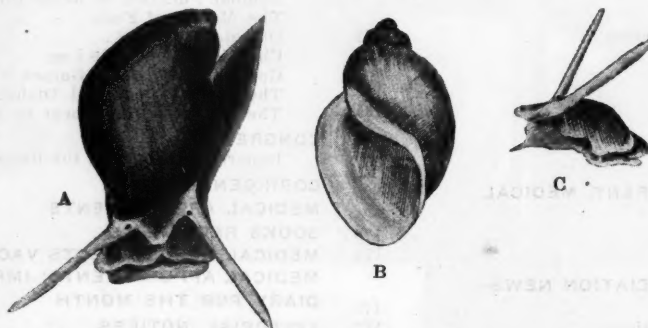


FIGURE 1.—*Bullinus Brazieri* (Smith).
A = Intact animal. B = Shell. C = Anterior extremity from side.

numbers of *Limnæa brazieri* in morasses or peaty springs.

Generally these *Bullinus* snails were either the sole type found or if present in any considerable number were the predominant type of that particular area. It is in fact my experience in Monaro that particular spots are inhabited either exclusively by one type or that one type predominates. I am aware that this experience has not been found to be true for various species in other parts of this State and it is, of course, possible that further observations under different conditions of season and weather may not support these observations. It is, however, sufficiently important to note that during the months of April, May, June, July and during the first week in August, at any rate with three of the species out of four dealt with in this report, *Bullinus brazieri*, *Bullinus tenuistratus* and *Limnæa brazieri*, this tendency to specific localization was very apparent.

Location.

The specimens of *Bullinus brazieri* dealt with in this communication were found in the situations

indicated below. This should be correlated with Table I. showing the results of search for cercaria in the same snails.

B1 was found in a bog and chain of weedy pools under willow trees close to main road from Cooma to Nimmitabel and about six miles from Cooma. Sheep and cattle were on the surrounding area and the sheep droppings collected showed ova of both fluke and *Hæmonchus contortus* (stomach worm). It is undulating country with much loose basalt. Only *Bullinus brazieri* were found; they were present in enormous numbers of all sizes.

B2 came from a rain-filled pond of about a quarter of an acre area seven miles south of Cooma. This is quite a shallow pond perhaps a foot or so at the deepest and shallowing out to a muddy edge. It is not a permanent collection as it dried up altogether once during the period of my observation. There was little or no growth or water weed. *Bullinus brazieri* was the only snail found and was present in large numbers all round the edges. There were also numbers of a small bivalve. Sheep were all round this pond. It was one of the principal watering spots and the owner states that the paddock is one of the healthiest parts of his run.

B3 was found in pools in a slow running creek about a half-mile west of the last. In the shallower pools there is a growth of watercress and in other parts there is much algal growth. The specimens were chiefly recovered from the under surface of the felted masses of the latter or on the fronds of another water weed (name unknown). This area is also remarkably sound country.

B4 is from a large pond of about a half of an acre area about a mile north of Cooma. This appears to be one of the many lagoon-like areas apparently due to the collection of rain water in surface depressions. It has not so far been observed by me to dry up and possibly may be fed by a spring. At our first visit in April we found numerous *Bullinus brazieri*, but did not note any *Limnæa*. At a subsequent examination of this pond made in June a few *Limnæa brazieri* were also found. In one hundred and ninety-nine snails collected six were of this species, the rest being *Bullinus brazieri*. It was from this pond that the only examples of cercaria infected *Bullinus brazieri* were obtained and the presence also of *Limnæa* is to be noted in this connexion (see L19). Disease data of this are unknown.

B5 was from the edge of a swift running creek, but not far from a boggy area; one only specimen of *Bullinus* was found and one *Limnæa brazieri*. The creek was one mile beyond Berridale on the Dalgety Road. No disease data were available. (See L9.)

B6 is from a slow running creek fourteen miles out from Cooma on the Maffra Road in the south. Plentiful *Bullinus* snails were found. No disease data were obtained.

B7 came from a chain of ponds in a rocky creek bed twenty-five miles south of Cooma on Maffra Road. These pools were several feet deep and the

snails were chiefly collected from the sides of large boulders forming their sides. This species was the only one found and was present in large numbers. The estate through which the creek runs, is a bad spot for both fluke and black disease, but has not yet been surveyed and data for the particular paddock as to fluke prevalence are wanting. On other parts of the estate are typical "black springs" which, as is shown later, are the particular breeding spots of *Limnæa brazieri* and to which the pastoralist attributes the origin of both black disease and fluke.

B8 is from a watering trough near a boggy spring about ten miles south of Cooma. There was an isolated specimen encountered amongst some hundred of *Limnæa* examined from this trough. It is a fluky area. (See L3.)

B9 is from a large "black spring" seeping out of a hillside about sixteen miles from Cooma on the Berridale Road. Two only of this species were encountered amongst very numerous *Limnæa brazieri*. It is a fluky area. (See L8.)

B10 is from slow running creeks about three miles from Berridale. These were the only species found. It was reputed to be sound country.

B11 came from a swamp at Rocky Plain, about thirty miles south-west of Cooma. There were only two found out of some hundreds of *Limnæa* collected. It is a fluky area. (See L11.)

B12 is from a creek seven miles from Cooma on the Berridale Road. This creek is close to the roadside and consists of a chain of stagnant pools. No disease data were obtained. It is the only species found.

B13 was collected from a slow running creek and pools sixteen miles from Cooma on the Berridale Road. The pools were deep, but the snails were found in the shallow edges. The deeper parts could not be examined. No disease data have been obtained. It is the only species found.

B14 was found in a slow running creek about four miles south-west of Cooma. There were plentiful *Bullinus brazieri* in this creek and only one *Limnæa* was found during the collection of a hundred or more *Bullinus brazieri*. Within a few yards was a "black spring" draining into this creek in wet weather which was crowded with *Limnæa brazieri* alone. It is a noted fluky area. (See L16.)

B15 came from a bog about a mile east of the last. Only a few snails could be collected owing to the difficulty of entering the bog which was very treacherous. One specimen of *Bullinus* was found, while twenty *Limnæa brazieri* were being collected. Black disease and fluke are prevalent in the paddock. (See L17.)

B16 is from creek beds near Bombala. It was raining heavily at the time and collection was difficult, but in better weather on the same estate but in different paddocks, plentiful *Limnæa brazieri* were found. The particular place where the *Bullini brazieri* were encountered was in a relatively healthy paddock on an estate which is in parts heavily infected with black disease and fluke and in these other parts *Limnæa brazieri* has so far been the sole species encountered.

B17 is from Peak Creek, about twelve miles west of Cooma at a spot two or three miles lower than the place from which T1 were collected. This creek was considerably overgrown with cress and other weed. In the particular spot *Bullinus tenuistratus* was the predominant variety, but smaller numbers of *Bullinus brazieri* and *Limnæa brazieri* were collected. Among the snails examined one hundred and fifty-eight were *Bullinus tenuistratus*, thirty-two were *Bullinus brazieri* and twenty-two *Limnæa brazieri*. Though these figures do not accurately indicate the ratio present, as all the *tenuistratus* were not examined, still they show an unusually mixed snail fauna. Higher up the creek on a previous occasion, only *Bullinus tenuistratus* were noted. (See T1, T2 and L22.) The upper part of this creek is probably fluky country and "black springs" in which *Limnæa brazieri* are present. Data are wanting from the lower area.

B18 is from a creek fifteen miles from Cooma on the Maffra Road. This creek is slow running and very weedy. It contains plentiful *Limnæa brazieri* and a few *Bullinus brazieri*. The examination figures show one hundred *Limnæa* and sixteen *Bullinus brazieri*. The ratio is for reasons above stated probably not absolutely correct. The situation is a bad black disease and fluke area. (See L23.)

B19 is from a small creek in a gully about three miles from Beridale. Two *Bullinus brazieri* and one *Limnæa brazieri* only were found. The area is fluky. (See L24.)

Bullinus Tenuistratus.

Description.

The Shell.—This is sinistrally spiralled. The spiral axis is considerably longer in proportion to the width across the widest part of the whorl than in the case of *Bullinus brazieri*. The opening of the shell is vulviform in contrast to the oval opening in *Bullinus brazieri*. Specimens collected varied greatly in size, the largest being about sixteen millimetres in the spiral axis and about eight millimetres across the widest part of the whorl.

The Animal.—The general appearance of the animal is similar to that of *Bullinus brazieri*. The tentacles are relatively longer and paler in colour and the eyespots are not easily seen from the dorsal aspect, being situate at the junction of tentacle and

a triangular area on the proboscis but on the ventral aspect of the ridge thus formed. The foot is relatively small compared with the spiral length of the shell and its posterior extremity is more rounded than is that of *Bullinus brazieri*.

Distribution.—The snail has so far been found in only one situation in Monaro in Peak Creek. Peak Creek is a stream which runs out of the mountains west of Cooma. The first samples were taken from the creek as it passes through an estate about thirteen miles west of Cooma and in that situation were the only species noted, but lower down the creek two or three miles they were found in association with smaller numbers of *Bullinus brazieri* and *Limnæa brazieri*. The upper Peak Creek finding was made in country probably fluky. [Refer in other part of the text to T1 (Upper Peak Creek) and T2 (Lower Peak Creek).]

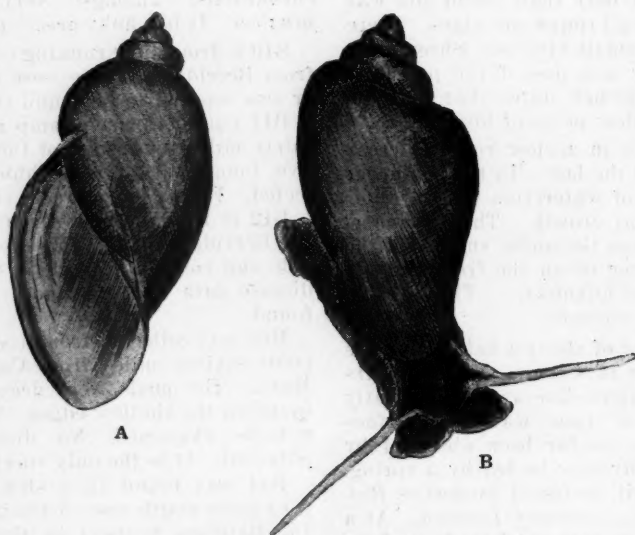


FIGURE 12.—*Bullinus Tenuistratus*.
A = Shell from ventral aspect. B = Intact animal from dorsal aspect.

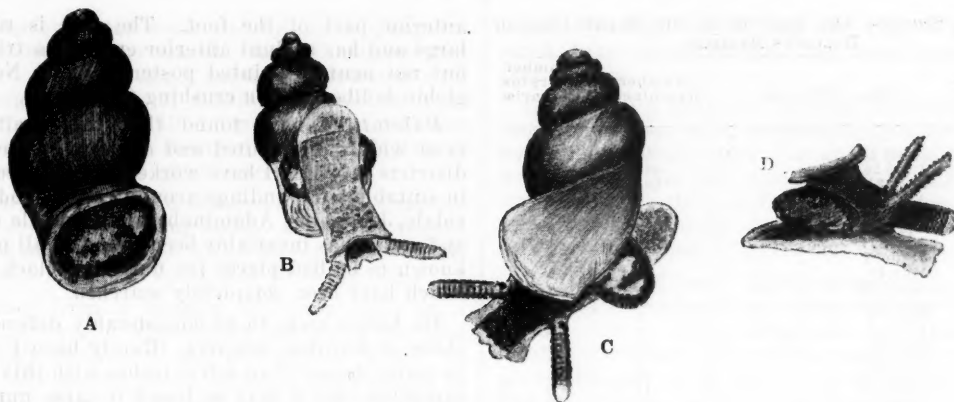
Potamopyrgus Sp.

Description.

The Shell.—This is a very small dextral spire averaging about two millimetres in the spiral axis and about half this size across the widest part of the whorl. There are usually five complete whorls. The opening of the shell is irregularly rounded, but becomes oval toward the innermost part. The largest diameter of the mouth is about half the length of the spiral axis.

The Animal.—This has very well defined characteristics which can best be observed

under a low power objective (one inch). The tentacles are relatively long but more cylindrical than tapered and are characterized by very distinct transverse wrinkling. A white line, sometimes accompanied by a dark companion, is noticed running the length of the tentacle and terminating close to the eyespot which is situate slightly behind and external to the junction of tentacle and proboscis. The proboscis is trunk-like, convex upwards and has dark lines of intense black pigment crossing it. These are clearly separate at the distal end and closer together towards the base, where the whole surface of the proboscis appears densely black and blends with the deeply pigmented dorsal surface of the head and neck. The extreme distal part of the proboscis is unpigmented and bifurcated, while slighter notches are to be seen on either side of the central one. The foot is lightly pigmented and almost transparent and is relatively small compared with the spiral axis

FIGURE III.—*Potamopyrgus* sp.

A = View from beneath; operculum closed. B = Intact animal from beneath. C = Intact animal from above. D = Side view.

length of the shell. Its anterior edge is more or less straight, the propodium forming a proboscis-like portion. On the dorsal aspect of the mesopodium and behind the neck is carried an oval *operculum* which contains an irregular ring of granular pigment. The posterior extremity of the foot is rounded.

Movements.—The movements of the animal are peculiar, the body being extruded and retracted very quickly, the movement of retraction being specially jerky and abrupt.

No hæmoglobin is freed on crushing this animal.

Distribution.—So far this species has only been found in two closely adjoining situations. The first was in springs on an estate ten miles south of Cooma and the second in the same general direction in a bog about fifteen miles from Cooma. It has been found in both cases in boggy areas that harboured *Limnæa brazieri* (see L3, a, b, L20). One *Bullinus brazieri* was also found in one of these situations (L3a, B8). Probably it will be found to have a wider distribution, but on account of its smallness it is very easily overlooked. It seems to

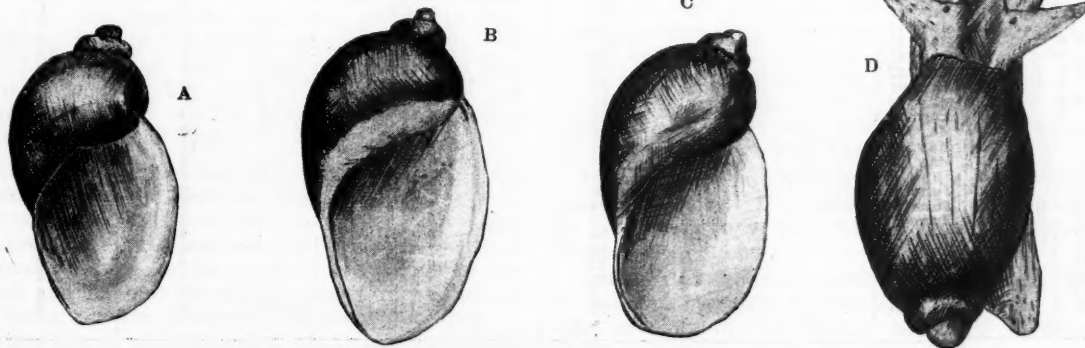
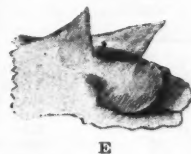
prefer the roots of water cress as a habitat, having been so far found only there.

Limnæa Brazieri (Smith).

Description.

The Shell.—This is very similar in general appearance to that of *Bullinus brazieri* except that, of course, the spiral is dextral. The size of specimens usually encountered would make it appear a much smaller snail than *Bullinus brazieri*, but specimens almost as large (fourteen millimetres in the spiral axis) have been encountered. The average snail seen, however, has not a longer spiral axis than seven to ten millimetres and apparently adult snails are found much smaller. The width across the widest whorl is rather greater than half the spiral length. The opening of the shell is oval.

The Animal.—This is easily identified and quite distinct from either of the *Bullinus* species. The tentacles are triangular flaps. The inner and anterior edges of the triangles meet the base of another

FIGURE IV.—*Limnæa Brazieri* (Smith).

A, B, C = Shell. D = Intact dorsal view. E = Side view head, etc.

TABLE I.—SHOWING THE RESULTS OF THE EXAMINATION OF *BULLINUS BRAZIERI*.

Reference Number.	Date Collected.	Number Examined.	Number Carrying Cercariae.
B1a	April 15	16	0
b	June 26	462	0
c	July 31	103	0
B2a	April 17	4	0
b	June 17	126	0
B3	April 17	7	0
B4a	April 17	20	1(?)
b	June 18	193	2
B5	May 19	1	0
B6	April 20	12	0
B7	April 20	15	0
B8	May 6	1	0
B9	May 19	2	0
B10	May 19	12	0
B11	May 22	2	0
B12	April 18	10	0
B13	April 19	11	0
B14	June 9	51	0
B15	June 9	0	0
B16	July 10	Not Exam'd	—
B17	July 24	32	0
B18	July 27	16	0
B19	August 7	2	0
Total	—	1,098	2 + (1?)

triangular area on the dorsal surface of the proboscis and just before this union are small rounded projections behind which are the eyespots. The posterior external edges of the tentacle triangles join the somewhat narrowed neck. The proboscis is a broad projection, rather wider anteriorly than where it joins the head. Anteriorly it is bifurcated by a central notch on the floor of which is a slight convexity. The proboscis is convex dorsally. It overlaps and from the dorsal aspect conceals the

anterior part of the foot. The foot is relatively large and has a blunt anterior end and a triangular but not acutely pointed posterior end. No hæmoglobin is liberated on crushing the animal.

Habitat.—I have found that this snail is the most widely distributed and common species in the districts in which I have worked. It has been found in suitable surroundings around Cooma and in Berriedale, Jindabine, Adaminaby and Bombala districts and so far has invariably been found in all paddocks known to be bad places for fluke and black disease, which have been completely searched.

Its habits seem to be considerably different from those of *Bullinus brazieri*. Rarely have I found it in water deeper than a few inches with this striking exception that it may be found in large numbers in certain watering troughs adjacent to "black springs" if these have been long uncleaned and contain water weed. Generally it is found to prefer shallow pools or puddles sometimes, covered with but a skim of water in the beds of the "black springs." I have found it also under the algal scum in shallow pools emerging from swampy areas and in shallow water perhaps itself weed free but adjacent to a swamp. Once I found an isolated specimen on the side of a fast running creek, but there also was a swamp near by. Specimens in considerable numbers were obtained from what appeared to be a rain filled pool about six inches deep, but this also was adjacent to a large swampy area. In the beds of certain creeks there were found occasional specimens, but these creeks were found to emerge above from typical black springs. Limnææ have been found plentifully in certain creeks that have been

TABLE II.—SHOWING THE RESULTS OF THE EXAMINATIONS OF LIMNÆÆ BRAZIERI.

Reference Number.	Date Collected.	Number Examined.	Number Carrying Cercariae.	Pigmented Type.	Unpigmented Type.
L1	April 1	37	6 (16%)	0	0?
L2	April 26	10	0	0	4?
L3a	May 6	23	4 (17%)	0	0
b	July 16	100	0	0	32
L4a1	May 12	50	32 (64%)	0	9
a2	June 6	16	9 (56%)	0	3
b1	June 6	33	3 (9%)	0	1
b2	July 14	99	1 (1%)	0	0
L5	May 15	20	0	0	0
L6	May 15	53	0	0	0
L7	April 15	8	0	0	0
L8a	May 19	59	5 (8.5%)	2	3
b	July 15	100	1 (1%)	0	1
L9	May 19	1	0	0	0
L10a	May 19	25	6 (24%)	0	6
b	August 7	58	22 (38%)	0	22
L11a	May 22	37	2 (5.4%)	0	2
b	August 4	22	3 (13.6%)	0	4
L12a	May 22	35	5 (14%)	1	6
b	August 4	296	6 (2%)	0	1
L13	May 25	5	1 (20%)	0	0
L14	May 25	60	11 (18%)	11	3
L15	May 25	31	5 (16%)	1	0
L16	June 9	60	1 (1.6%)	0	0
L17	June 9	20	1 (5%)	0	1
L18	June 12	104	4 (3.8%)	2	2
L19	June 19	6	0	0	0
L20	July 19	32	3 (9%)	0	3
L21	July 27	36	1 (2.8%)	0	1
L22	July 24	22	6 (27%)	0	6
L23	July 27	100	4 (4%)	0	4
L24	August 7	1	0	0	0
L25	August 7	22	8 (36%)	0	8
Total	—	1,581	150 (9.5%)	19	121 + (4?)

choked up by water weed and by this a quagmire condition has been produced. In one instance they have been found in small numbers associated with much larger numbers of *Bullinus brazieri* in what is apparently a rain filled lagoon. This pool has not, however, yet been observed by me to dry up as have others of similar appearance.

To summarize *Limnæa brazieri* appears primarily at any rate to be a swamp snail. Data with regard to the actual locations in which the specimens dealt with in this communication, will be found below.

L1 came from a number of peaty bogs in a mountainous region about 4,500 feet above sea level in the neighbourhood of the Gungaharland River. It was the only species found during a day's search in that area in April. Although several of the springs were apparently free from any snails in the particular springs in which they were found, they were numerous. The district is bad generally for fluke and black disease.

L2 is from a "black spring" on a northern hill slope at about 4,000 feet above sea level and about twelve miles west of Cooma. It was the only species found in the bog and occurred in considerable numbers. This area was stated by the owner not to be fluky, but other evidence indicates the contrary. This bog was near the upper part of Peak Creek (see T1, T2, B17, L22.)

L3 is from troughs and "black springs" about ten miles south of Cooma. The specimens were chiefly found in the troughs in which there were literally thousands. On the first occasion one *Bullinus brazieri* was also present among the snails collected for examination from a trough. On the second examination only *Limnæa brazieri* were encountered. It is not absolutely certain that the identical trough and spring was revisited or another in the same neighbourhood. On both occasions plentiful *Potamopyrgus* sp. were found in the roots of the water cress that was thick in the springs (see B8). This is reputed to be a bad spot on an otherwise fairly sound estate.

L4 is from a "black spring" and from a trough supplied therefrom on a hill side about seven miles north-east of Cooma. Several collections were made from this spring and on each occasion only *Limnæa brazieri* were found and these were present in large numbers both in the spring and in the trough. On the first occasion snails were collected from both sources together, but on later visits collection was made from both sources separately. The area is reputed to be non-fluky.

L5 is from a creek and spring near by, both being weedy. These collections were made after very heavy rains and the creek had been thoroughly scoured. The area was about fifteen miles south of Cooma. Owing to the scoured conditions of the creek and bog only twenty specimens were collected, all being *Limnæa brazieri*. The district is fluky.

L6 is from a large fenced-in bog in the same estate as the last and from the surrounding shallow water numerous *Limnæa brazieri* were the only specimens

found. This particular bog had been a source of much fluke infestation and had been fenced in for that reason.

L7 is from a pool in a creeklet which was at the time almost dry, being represented by a few shallow pools under some willows, in which pools there was water cress. The site was close to Rock Flat Railway Station. Only a very few *Limnæa brazieri* were found and many were dead. No other variety was present. There is no disease data.

L8 is from a large "black spring" on a hill side about sixteen miles from Cooma on the Berridale Road. This is a very large and typical area containing cress and other water weeds and had been much ploughed by the feet of cattle and is very soft. The main source of the water emerges on the crest of the hill and causes a permanent bog of an acre or more in extent. The drainage runs into a creek which itself in places adjacent is blocked and rendered boggy by water weed. The specimens were almost exclusively *Limnæa brazieri*, but a few *Bullinus brazieri* were found (see B9). The area is fluky.

L9 is represented by one *Limnæa brazieri* and one *Bullinus brazieri* found on the side of a rapidly running creek one mile beyond Dalgety on the Berridale Road. There is boggy land near by (see B5).

L10 is from two big fenced in "black springs" on an estate near Berridale. A creeklet runs through the area and attempts to drain same were in progress when the search was made. *Limnæa brazieri* was the only type found and was very plentiful. The paddock is a known fluky area.

L11 is from a large swamp near a creek into which it drained about thirty miles south-west of Cooma. This area has been much ploughed up by the feet of cattle and contains much water weed. There were plentiful *Limnæa brazieri* and only two *Bullinus brazieri* were encountered. The paddock is a notorious fluky spot (see B11).

L12 is from another typical hill side "black spring" about two miles from the last. Plentiful *Limnæa brazieri* were the only specimens found. The paddock was a known fluky area.

L13 is from a pond a few yards away from a running creek in Adaminaby. This pool contains some water weed. A very few *Limnæa brazieri* were collected and were the only type noted. The sheep in this paddock were dying from liver rot in large numbers, but were almost certainly infected in another paddock (see L14 and L15).

L14 is from a rain-filled pool on some estate about two miles away. It is about six inches deep close to a marshy bog (see L15). Plentiful *Limnæa brazieri* were found.

L15 is from the main marsh near the latter. This is not an absolutely typical area, but there is an acre or more of flat country in which are boggy parts and small pools. *Limnæa brazieri* was the only species found and was present in large numbers. This paddock is the only area on the estate

with any wet areas except the pool referred to and has probably been the source of the outbreak of liver rot. The estate was previously free from fluke (see L13 and L14).

L16 is from a bog about four miles south-west from Cooma. This is a typical weedy "black spring" and in it *Limnæa brazieri* were found alone, but about fifty yards away there is a creek with deep pools and in these there were large numbers of *Bullinus brazieri* and only one *Limnæa brazieri* was found there, although in wet weather the bog must have drained directly into the creek. This is a noted fluky spot (see B14).

L17 is from a bog about a mile east of the last. This is a very treacherous area and the collection was very difficult. One *Bullinus brazieri* and twenty *Limnæa brazieri* were recovered. This is a bad fluky spot (see B15).

L18 is from typical weedy bogs at the heads of several creeks on an estate near Bombala. Very few snails were found in the creeks themselves and as there had been heavy rain, these were probably washed there from the bogs above. In the spring head bogs *Limnæa brazieri*, the sole specimens, were numerous. On another occasion and in a different area on the same estate a few *Bullinus* were collected. The estate and especially the particular paddocks in which the above *Limnæa brazieri* were collected, was notorious for black disease and fluke.

L19 is from what appears to be merely a shallow surface collection of water in the form of a large pond about a mile north of Cooma. It should be noted that this pool has not during the period of these observations dried up as have other similar ponds. On the first occasion on which this pond was examined (in April), only *Bullinus brazieri* were found, but at a subsequent examination made in June a small number of *Limnæa brazieri* were also found to be present. Then out of one hundred and ninety-nine snails collected for examination six were found to be *Limnæa brazieri*. No disease data were obtainable (see B4).

L20 is from the bog at the head of a creek which crosses the Maffra Road about fifteen miles from Cooma to the south. Plentiful *Limnæa brazieri* alone were found. This was a notorious fluky spot till it was fenced in. The creek below is filled with water weed and the paddocks through which it runs, is said also to be bad for fluke and black disease.

L21 is from another bog on the same property. This is a typical "black spring." *Bullinus brazieri* and *Limnæa brazieri* were the only species found and were plentiful. This is also probably a source of fluke infection.

L22 is from Peak Creek some miles lower down than where the specimens T1 were recovered. *Bullinus tenuistratus* was the predominant species, but smaller numbers of *Limnæa brazieri* and *Bullinus brazieri* were also found. Higher up the creek *Bullinus tenuistratus* alone was found at a previous examination (see T1 and B17).

L23 is from a small slow running weed filled creek fifteen miles from Cooma on the Maffra Road to the south. Plentiful *Limnæa brazieri* and a few *Bullinus brazieri* were found (see B18). This is in a fluky area.

L24 is from a creeklet in a small gully near Berri-dale. Only three snails were found, one a *Bullinus brazieri* and two *Limnæa brazieri* (see B19). This is a fluky spot.

L25 is from a creeklet arising from a very small spring. There is a little water weed in the creeklet. *Limnæa brazieri* was the only species and was found in small numbers. The area is fluky.

GENERAL BIONOMICAL OBSERVATIONS.

It must be first admitted that the period of observation is as yet too short to permit hard and fast conclusions to be made on many very interesting aspects of the bionomics of the several water snails of Monaro. None the less there are quite a number of interesting notes made by me that may be recorded here, even if further work may give a different interpretation as to their exact meaning.

Inasmuch as we have so far found *Bullinus tenuistratus* only in one creek and as the *Potamopyrgus* species has been recovered in only two closely adjoining situations, these two species need not at present be further considered. Also as the object of this communication is epidemiological rather than biological and as neither of the above can on the present evidence be connected with the spread of any disease, such scanty observations as I have made as to their mode of life may more fitly be reserved for a future communication.

Quite otherwise is the case with regard to *Bullinus brazieri* and *Limnæa brazieri*, as both of these snails have been found over a fairly wide area in various parts of a district which is known to be infected with fluke and the apparently associated black disease.

It is therefore important to collect all possible evidence as to their modes of life and to note any differences between the two species as regards their general bionomics.

Something may be said as to the nature of the available water collections in the district. One of the most striking features of the locality is the presence in various situations of areas known locally as "black springs." These may be, in fact frequently are, situated on the hill side and are quagmire spots produced by the eruption of more or less permanent springs. The volume of water coming from the springs varies a great deal in different places and the area rendered marshy there varies much in extent and in relative wetness. Sometimes the black spring may have little or no permanent drainage therefrom, while on other occasions it may be the origin of a creeklet of greater or less degree. If sheep or cattle have access to these areas and especially the latter, the

TABLE III.—THE RESULTS OF SNAIL CERCARIA EXAMINATION IN MONTHLY GROUPING.

Bullinus Brazieri.				Limnæa Brazieri.			
Date.	Reference Number.	Number Examined.	Cercaria Found.	Date.	Reference Number.	Number Examined.	Cercaria Found.
April 15	B1a	16	0	April 1	L1	37	6 (16%)
April 17	B2a	7	0	April 15	L7	8	0
April 17	B3	20	1?	April 26	L2	10	0
April 17	B4a	10	0				
April 18	B12	12	0				
April 20	B6	15	0				
April 20	B7	4	0				
Month of April	—	84	1? (1.2)	Month of April	—	55	6 (10.9%)
May 6	B8	1	0	May 6	L3A	23	4 (17%)
May 19	B13	11	0	May 12	L41	50	32 (64%)
May 19	B9	2	0	May 15	L5	20	0
May 19	B5	1	0	May 15	L6	53	0
May 19	B10	12	0	May 19	L8a	59	5 (8.5%)
May 22	B11	2	0	May 19	L9	1	0
				May 19	L10	25	6 (24%)
				May 22	L11a	37	2 (5.4%)
				May 22	L12a	35	5 (14%)
				May 25	L13	5	1 (20%)
				May 25	L14	60	11 (18%)
				May 25	L15	31	5 (16%)
Month of May	—	29	0	Month of May	—	399	71 (17.8%)
June 9		51	0	June 6	L42	16	9
June 9		1	0	June 6	L43	33	3
June 17		126	0	June 9	L16	60	1
June 18		193	2	June 9	L17	20	1
June 26		462	0	June 12	L18	104	4
				June 18	L19	6	0
Month of June	—	833	2 (0.24%)	Month of June	—	239	18 (7.5%)
July 24	B17	32	0	July 14	L44	99	1
July 27	B18	16	0	July 15	L8b	100	1
July 31	Lc	103	0	July 16	L3b	100	0
August 7	B19	2	0	July 19	L20	32	3
				July 24	L22	22	6
				July 27	L21	36	1
				July 27	L23	100	4
				August 4	L11b	22	3
				August 4	L12b	296	6
				August 7	L10a	58	22
				August 7	L24	1	0
				August 7	L25	22	8
July 1 to Aug. 7	—	153	0	July 1 to Aug. 7	—	888	55 (6.1%)

surface becomes pitted with numerous "pot holes" which usually contain water about half an inch deep and which are floored with a powdery deposit of black mud. Where the areas have been fenced off as is frequently done (for the pastoralist recognizes the close connexion between them and disease in his stock, fluke, worm and black disease), grass and reeds are apt to grow rankly and this seems to block the exit of the water, for it is found frequently that small areas that have been fenced, tend to increase and eventually the marsh passes the limit of the fencing. These typical black springs are the special sites in which *Limnæa brazieri* are found in abundance, though on occasions even in the most typical areas a few *Bullinus* have been found. In these areas there are usually in addition

to various grasses and moss, several types of purely water weed; they are often overgrown with water cress and algæ. Having described above a typical area, I would point out that very similar conditions may be found at times in the actual beds of the slower running creeks where an area of greater or less extent becomes choked up with water cress and other weeds and so brings about a condition of relative stagnation and quagmire. Apart from these, there are, of course, several other types of water collections. There are rapidly running main streams and rivers, slower running streams which in dry weather may be represented by chains of quiet ponds, and there are lastly the lagoon-like ponds which are generally due to the accumulation

of rain and many of which dry up during a few weeks or months of dry weather.

Broadly speaking, it may be stated that our observations made during April to July inclusive indicate that *Bullinus* is a pond snail and *Limnæa brazieri* a swamp snail. Few snails, if any, are found in the large rapidly running streams and none so far in any river. I have found *Bullinus brazieri* chiefly in ponds or in the pools of quiet streams and often unassociated with water cress or with any other water weed.

Limnæa brazieri, on the other hand, seems to prefer the weedy black oozes. A very few *Limnææ* have, it is true, been recovered from the beds of streams, but their presence there can generally be attributed to the result of heavy rain washing them from their quagmire homes or because in the stream or near by are spots possessing similar quagmire conditions by the blocking of the creek by the growth of water weed.

As an exception to this statement may be instanced the finding of very numerous *Limnææ brazieri* in the water troughs in certain paddocks. But in every case there has been near by a suitable marshy spot in which *Limnæa* can be (probably always) found, though it must be admitted that the number in the trough when found was often far greater than that recovered from the swamp. It must be remembered, however, that there is often a very real difficulty in the actual recovery of specimens from some of the marshes, not only because of the treacherous nature of the soil (cattle quite frequently become bogged and die in these areas), but also because of the relative difficulty of finding the comparatively small snails in between masses of water weed and in the easily disturbed flocculent muddy deposit of the pot holes.

Therefore, the apparent relative snail population in trough or swamp may easily be wrongly judged. Wherever we have found the *Limnæa* in the trough, this invariably showed the presence of water weed, algae and the like.

So far I have not encountered more than an odd *Bullinus* in any trough and as these troughs are usually in relation to bogs rather than streams or ponds, this tends to support the above contention as to the preference of *Bullinus* for the latter two situations.

Bullinus is very commonly present in the temporary collections of water which form shallow lagoon-like areas in many situations round Cooma. Though it appears that a certain degree of permanence of the pond is essential (for many of the smaller collections are uninfected), still I have found this snail in ponds which undoubtedly dry up completely from time to time and which are not in the immediate vicinity of other creeks or ponds. This, of course, indicates some method of survival, for fully developed adult snails are found again in such ponds a few days after the dried area has been refilled. As a matter of fact it can be demonstrated readily enough that the dried mud entombs

numerous snails many of which appear to be dead, but recover after a few hours if immersed in water.

As I have found *Limnæa* only rarely and then sparsely in one such pond and as this has not so far dried up, I am unable to say whether it also can by becoming buried in the half dry mud and temporarily sealing itself survive over a period of drought as does *Bullinus brazieri*.

Temperature.

During the months March to July inclusive both *Bullinus* and *Limnæa* snails have at all times been easily recoverable from suitable situations and their activity has not shown any notable alteration. Snails of many various age and sizes have been found from a few millimetres long upwards, suggesting that breeding may be continuous during these months and the presence of thick sheets of ice on the water does not seem to be objectionable to either species. Heavy rain by obscuring the animals renders them less easy to locate and observations as to the presence of snails should not be attempted in such weather. Apart from spreading the snails rain does not seem to have any effect on their activity.

The eggs of *Limnæa brazieri* are deposited as sausage-shaped, jelly masses about six millimetres long by three millimetres across. They adhere lightly to water weed. The seasonal occurrence of the maximum egg content of the swamps has not yet been fully studied. The egg masses of *Limnæa brazieri* can be distinguished with ease from those of *Bullinus brazieri*. The latter is of firmer consistency and adheres much more closely to the water weed. There is considerably more material between the individual ova of *Limnæa brazieri* and the ova themselves are smaller than those of *Bullinus brazieri*. All stages of egg development have been watched by me, but will not be described here.

The Cercaria Carrying Capacity of Water Snails.

Technique.

Nearly all the snails examined have been treated individually, each snail being crushed between two microscopic slides and examined with low power objectives and eye pieces without special treatment or staining. Special attention is directed to the scrutiny of the liver. In a few instances, however, in the early stages of the work more than one snail was crushed at one time and the centrifuged deposit was searched, but this method was soon discarded.

Measurements were made by the usual micrometric procedure. All the drawings were made from actual specimens of the living animal or from specimens of the shell. They are freehand sketches and not all drawn to exactly the same scale. A camera lucida was not used.

Frequency of Infestation.

The number of specimens of *Limnæa brazieri* examined was 1,581 and one hundred and fifty of these contained cercaria of some type.

Of the 1,099 specimens of *Bullinus brazieri* examined only two contained any cercaria.

ILLUSTRATIONS TO DRS. HAMILTON MARSHALL AND KEITH INGLIS'S ARTICLE.



FIGURE I.

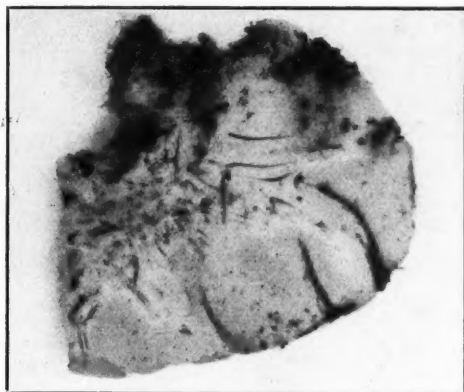


FIGURE II.



FIGURE III.

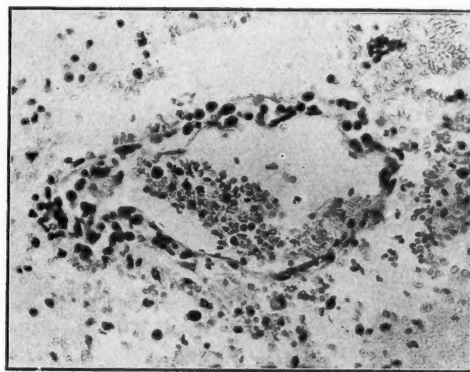


FIGURE IV.

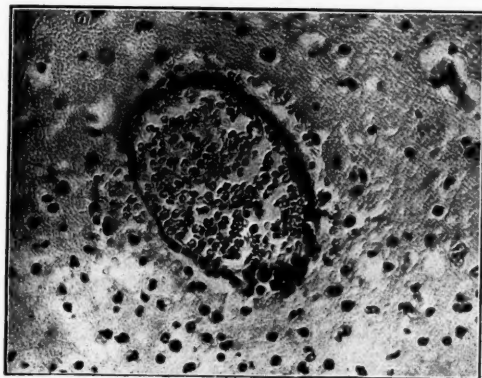


FIGURE V.

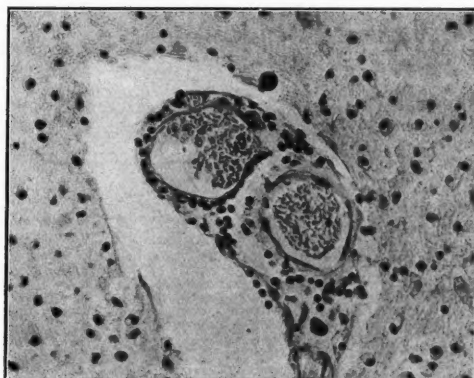


FIGURE VI.

ILLUSTRATIONS TO Drs. HAMILTON MARSHALL AND KEITH INGLIS'S ARTICLE.



FIGURE VII.

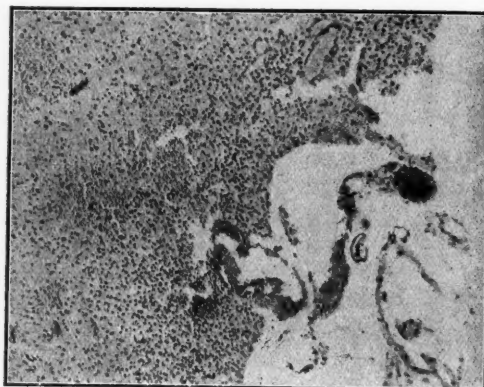


FIGURE VIII.



FIGURE IX.



FIGURE XI.



FIGURE X.

ILLUSTRATIONS TO DRs. HAMILTON MARSHALL AND KEITH INGLIS'S ARTICLE.

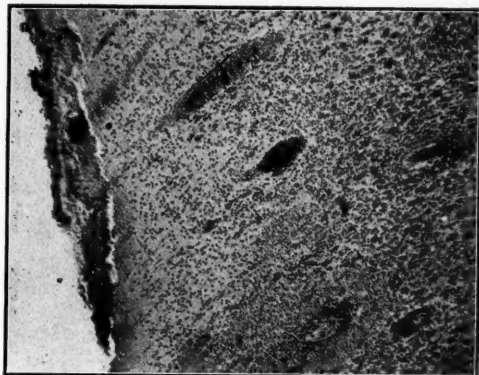


FIGURE XII.

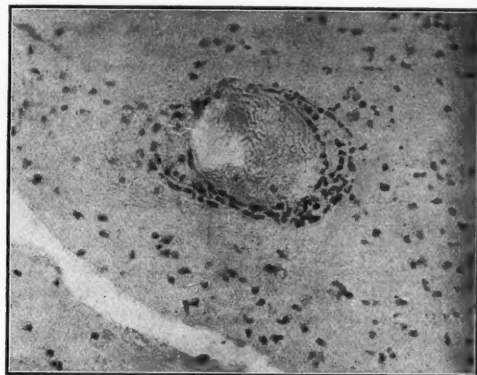


FIGURE XIII.

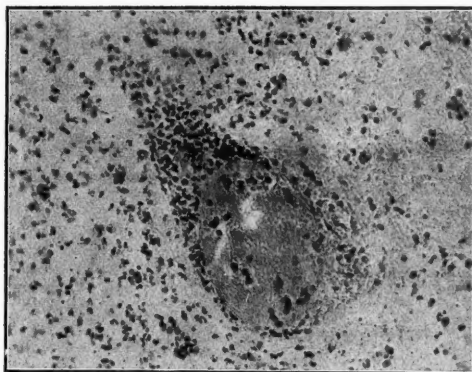


FIGURE XIV.

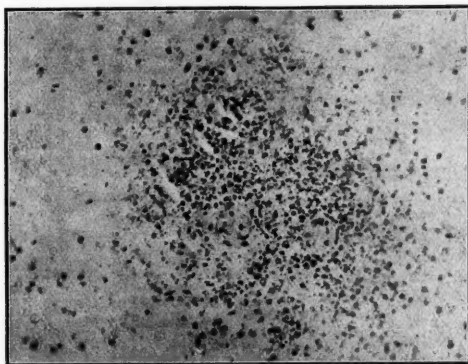


FIGURE XV.

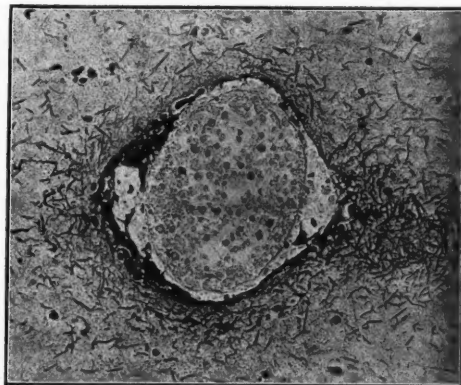


FIGURE XVI.

ILLUSTRATIONS TO DR. JAMES M. PETRIE'S ARTICLE.

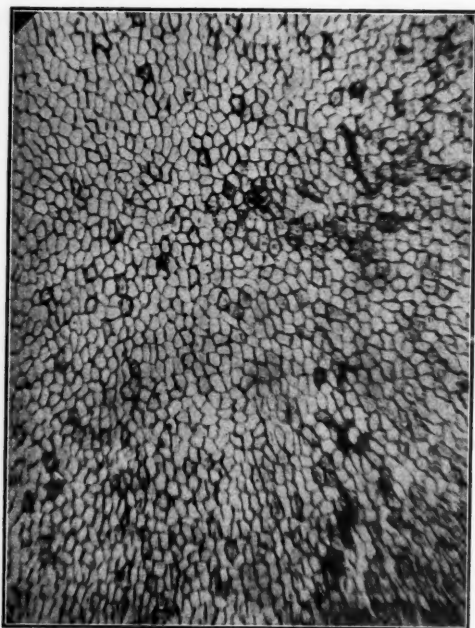


FIGURE I.
Mesentery of guinea pig $\times 60$.

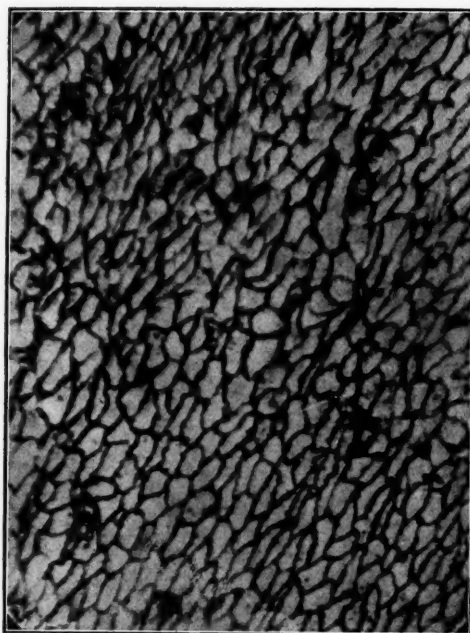


FIGURE II.
Mesentery of guinea pig $\times 120$.

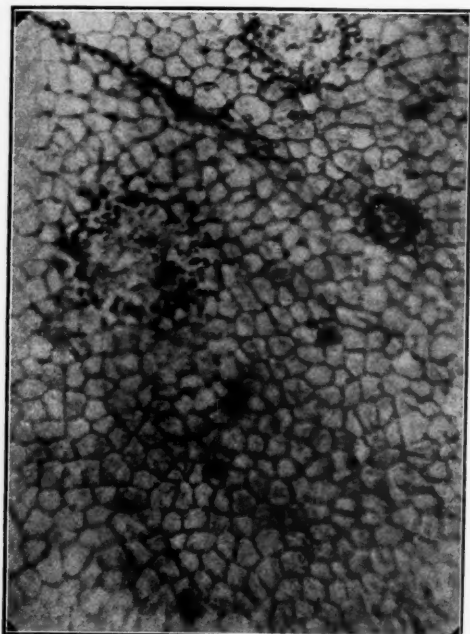


FIGURE III.
Pericardium of rabbit $\times 120$.

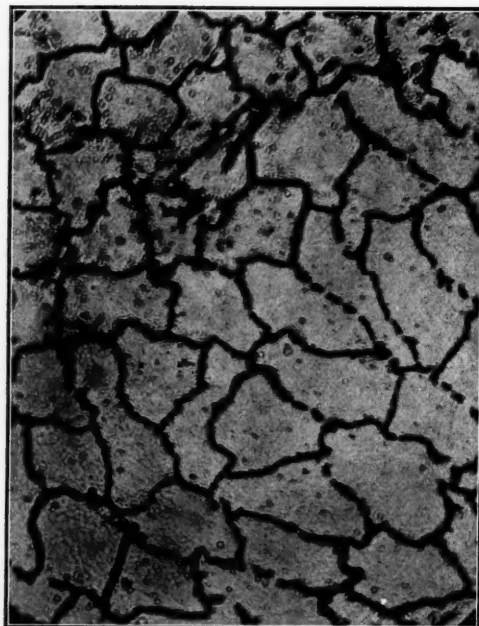


FIGURE IV.
Omentum of guinea pig $\times 500$.

Among the 116 specimens of *Potamopyrgus* sp. examined, none contained cercaria.

Similarly 171 specimens of *Bullinus tenuistratus* were examined and no cercaria were found.

As stated above very little has been published with regard to the cercaria carrying capacities of Australian water snails and there appears to be little or nothing in the way of information as to the method of spread of the sheep or cattle flukes in this country.

In Europe as is well known the water snail *Limnæa truncatula*, is the intermediate host of *Distomum hepaticum*, the European sheep fluke. Whether or not the fluke infesting Australian sheep is identical with this (and there seems some small but definite doubt on this point), there are practically no data available as to the exact means of spread of the fluke found in this country.

Cobb, referred to previously, seems to have been the only person to have given attention to the matter and as stated the evidence on which he incriminates *Bullinus* as the carrier of the sporocyst, redia and cercaria stage of the sheep fluke is not convincing. I have attempted to settle the question firstly by the examination by individual microscopical specimens of large numbers of the various types of snails, the examinations being directed to the nature of cercaria carried, to the percentage infestation rate and to the local distribution of the various snails and the relationship of this distribution to paddocks which are known to be sources of origin of fluke. As these epidemiological investigations proceeded, I obtained as I expected indications pointing to the nature of the transmission of fluke in this locality and as to the probable type of snail responsible. The next step is naturally to check the hypothesis thus raised by attempts to infect the selected variety directly with artificially hatched miracidia from eggs collected.

The above paragraph indicates the methods adopted by me to date and although the work, as will be seen, is still incomplete, the results will, I believe, be found of considerable interest.

It should be noted that it is quite possible that the snail cercaria survey which is being continued especially with a view to provide data as to seasonal and other factors affecting the issue, will modify the present tentative conclusions, but the facts disclosed below seem already to make out a strong *a priori* case in favour of the contention that *Limnæa brazieri* may act as an intermediate host of the sheep fluke.

Reference to the tables will show that approximately one thousand five hundred of the species *Limnæa brazieri* and eleven hundred of the species *Bullinus brazieri* have been examined by direct microscopical methods for cercaria and that in the former snail out of the total examined during the period April to July inclusive 9.5% contained cercaria of some or other type, whereas in a similar number of *Bullinus brazieri* there were found less than 1% infected and there is some ground for doubt as to the actual value of this figure. It

can also be seen by reference to Table III. in which the examination figures are set out according to the monthly returns, that the infestation rate for any month is in the case of *Limnæa brazieri* far in excess of *Bullinus brazieri*, which except in the isolated case of snails from one pond is nil.

Cercariae Found in Bullinus Brazieri.

On only three occasions have any cercaria or other stages of fluke been found in *Bullinus brazieri*. Encysted stages of some trematode were at times noted. During April on the seventeenth of the month twenty snails were crushed together and samples of the deposit examined for cercaria. One only cercaria without a tail was discovered after continued search. The finding of one tailless form is of doubtful significance, as it might have been free in the water necessarily included.

Limnæa brazieri has been found in small numbers in this pond in addition to the predominant species *Bullinus*. The other two positive findings also occurred in snails from this same pond and were made by my assistant during a temporary absence from the laboratory and were not checked by me. In this case there were redia and cercaria well developed and the infestation of the two snails seems therefore certain.

There is nothing to state here about the types found in these snails, as the tailless specimen did not enable much data to be gathered and the other two specimens were not observed by me nor drawn nor measured. They were, however, of the small unpigmented type to be described later.

Cercariae Found in Limnæa Brazieri.

At least two types of cercaria have been found in *Limnæa brazieri*, the commonest type being for the present termed "unpigmented form," the other less frequently found being hereafter referred to as the "pigmented form." In Table II. the data concerning 1,024 *Limnæa brazieri* are given. The cercariae are divided into the two types. The variation in the infestation rate is very considerable. In one case it will be seen that 64% of these snails from one situation carried cercaria (probably all of the unpigmented form). In other cases none were found to be infested. Apart from the different infestation rate in different places at or about the same time there seems to be a general and steep fall in the general infestation rate of certain cercaria with the onset of the colder weather.

Types of Cercariae Found in Limnæa Brazieri.

Two very distinct types of cercariae were noted and these may for the present purpose be referred to as the "unpigmented" and the "pigmented type." There are good grounds for believing that in the first group at least two different types of cercariae have been included one of which is a small stylet cercaria and the other a somewhat larger non-stylet cercaria. Measurements of the bodies of this type average about 0.2 millimetre by 0.13 millimetre and the tails varied from 0.2 millimetre to 0.6 millimetre. In certain cases only sporocyst

tubes could be made out, while in others well developed redia were present. This unpigmented group is being further studied. Of greater interest is the other group which appears to contain only one definite type called for the present the "pigmented form."

The measurements of the "pigmented type" yielded an average body of 0.3×0.2 millimetre and an average tail length of 0.6 millimetre. The body may be as in the other species greatly elongated by creeping movements.

This form is characterized by greater size of both body and tail and by a more distinct heart shape when in repose, but chiefly by the possession of dark granular pigment which renders it a very conspicuous object even when enclosed in the redial form. Redia of all stages have been noted, but definite sporocysts have not yet been identified.

It is recognized that the descriptions above are not complete and when opportunity offers a more detailed study will be made, but for the purpose of the particular investigation and report they will suffice. It will be noted that the measurements and description fit closely to the description by Thomas of the cercaria of *Distomum hepaticum*.

Since this has been written material has been received from Dr. Cawson, of South Africa, consisting of redia and cercaria from *Limnæa natalense* which is the African transmitter of *Fasciola hepatica* and/or *Fasciola gigantica*. The redia and cercariæ in this material are almost undoubtedly the same as those identified by me as the cercariæ of the sheep fluke here. I have not yet had opportunity to measure the same and go into minute detail, but their similarity to if not identity with the "pigmented type" cercaria and the big differences manifest from all other cercariæ so far found, make additional facts in tending to prove my contention that *Limnæa brazieri* (which snail alone has been found to harbour such cercariæ) is indeed the transmitter of sheep fluke in New South Wales.

Individual Degree of Infestation.

Both types may be found in large numbers in any particular snail. In some instances it was estimated that a single specimen of *Limnæa* contained several thousands of complete, active cercariæ.

Other Notes on the Cercariæ Found.

Several experiments were made to determine the period of survival of the complete cercaria in water. In the tests so far made it was noted that the large

majority die within twelve hours; a few individuals were still feebly moving after twenty hours. Both varieties have been observed to encyst under laboratory conditions.

Several times cercaria have been observed to leave the living snail as it crawled through a film of water under the microscope.

THE PROBABLE CARRIER OF SHEEP FLUKE IN NEW SOUTH WALES.

The facts to date undoubtedly present a strong case for the hypothesis that *Limnæa brazieri* is the carrier of the intermediate stages of the sheep fluke in this State.

The survey already enables us to exclude definitely *Bullinus tenuistratus* and probably to exclude *Potamopyrgus* sp. The former snail is but sparsely distributed, having been so far found only in one particular stream. *Potamopyrgus* has also been found in but two situations, but it must be remembered that the smallness of this specimen makes it difficult to find and it may prove to be more widely dispersed than at present appears. Over a hundred of these tiny snails have been examined without finding any cercariæ. It is at any rate obvious that the two species, *Bullinus brazieri* and *Limnæa brazieri*, have a distribution more likely to enable either to be the intermediate host of fluke in sheep. They appear to be the commonest snails in the Monaro district and their presence in situations accessible to sheep often in large numbers gave early promise that one or other or both might be related to the spread of this disease.

When we look into the matter further it becomes increasingly more evident that the distribution of *Limnæa brazieri* fits much better the other epidemiological considerations than does that of *Bullinus brazieri*.

As part of the investigation numbers of reports, verbal and written, have been obtained from pastoralists of experience relative to the incidence of fluke and black disease on their individual holdings. These data have been correlated with the snail and fluke cercaria findings wherever possible and emerging therefrom comes the fact that *Bullinus brazieri* is present in large numbers in situations in paddocks regarded as the healthiest and is frequently not present or is sparse in paddocks known to be particularly bad spots for these diseases.

Limnæa brazieri on the other hand is invariably present in our experience in paddocks known to be

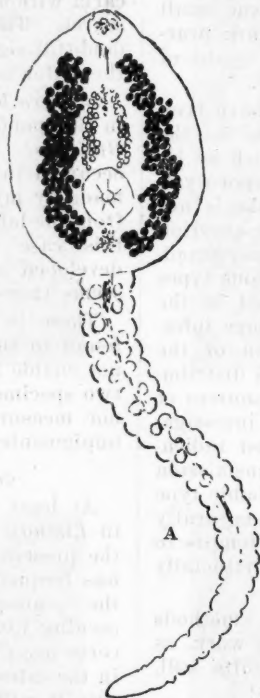


FIGURE V.—Fluke Cercaria found in Monaro Water Snails. "Pigmented Type."

bad for fluke and black disease. *Limnæa brazieri* is, as explained above, a swamp snail and is found to be partial to the very black springs which experienced men agree are the undoubted sources of fluke and black disease and which on the whole are far more accessible situations to sheep than are the majority of the situations preferred by *Bullinus brazieri*, the creek or pond snail. The cercaria findings in the two species undoubtedly support the above contention, but, of course, especially as *Limnæa brazieri* transmits at least two types of cercaria the case cannot be conclusively proven unless the actual miracidia of the fluke are shown to enter and develop in the *Limnæa* snail. Experiments have been attempted on these lines, but considerable difficulty has been encountered in hatching the fluke eggs which if left at the present cold room temperature do not develop or develop extremely slowly and which do not complete their development in the dark under incubator conditions. Sunshine and a liberal oxygen supply appear to be necessary. I am now trying to hatch batches of eggs both in the warmer atmosphere of Sydney and by a combination of indoor and sunshine exposures in Monaro.

The pigmented type of cercaria as stated above agrees accurately with Thomas's measurements and description of the cercaria stage of the sheep fluke.

Since the bulk of the foregoing was completed I have had the opportunity of checking and extending the snail observations in other districts, having during the month of August made a trip through Maitland, Singleton, Muswellbrook, Scone, Tamworth, Armidale, Walcha, Guyra, Glen Innes, Inverell, Denman, Mudgee, Bathurst and Goulburn. Although it was only in the Guyra, Uralla and Walcha areas that opportunity presented itself for detailed snail study in cooperation with pastoralists of experience to guide me to their bad paddocks, it has been possible throughout the tour to collect a good deal of general information on the matter. From information from the graziers combined with the results of my own observation of the type of country, presence of springs and so forth and from a number of detail snail and cercaria tests made in New England I was able to confirm completely the general question of the association of fluky spots and *Limnæa brazieri* and also to note the absence of this snail in healthy areas.

There is a considerably wider snail population in the northern districts, at least seven species having been found during my tour, but in the Monaro district the universal association of *Limnæa brazieri* with fluky spots was at once apparent. Many of the other species were found in known healthy paddocks and areas. Although the cercaria examination of the snails collected is not yet complete, I have already found several of the *Limnæa brazieri* carrying the pigmented form of cercaria described above.

The studies in the north confirm the swamp-loving characteristics of *Limnæa brazieri* and the relation of the particular type of swamp to fluke.

CONCLUSIONS.

1. The result of a detailed snail survey of the Monaro district shows that *Limnæa brazieri* is consistently found in the suitable bogs and in paddocks known to be "fluky" and frequently is the sole species present.
2. It is usually absent in paddocks which pastoralists found to be healthy.
3. Several other types of snails are found in both healthy and unhealthy districts and notably in some paddocks regarded by experienced graziers as their healthiest.
4. *Limnæa brazieri* alone of the four snails commonly found in the water collections of Monaro shows a high percentage rate of infestation with fluke embryos (probably carrying several types).
5. One of the cercariae found in *Limnæa brazieri* corresponds closely with the description given by Thomas of the cercaria of *Distomum hepaticum* in England and the measurements also correspond correctly to the second place of decimals in millimetres with the measurements of the cercaria state of *Distomum hepaticum* given by him.
6. *Limnæa brazieri* has been found consistently in every paddock known to be "fluky" which I have visited and examined in the New England area in boggy spots similar to those in which it has been found in Monaro. Here also it is at times the only snail present in infected paddocks.
7. The same "pigmented" cercaria has been found in *Limnæa brazieri* from New England as in the southern area.
8. A strong *a priori* case has been established for the theory that *Limnæa brazieri* is the transmitting agent of the sheep fluke in New South Wales.

ENCEPHALITIS.

By H. HAMILTON MARSHALL, M.B., Ch.M.,
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WITH A PATHOLOGICAL REPORT,
By KEITH INGLIS, M.D., Ch.M. (Sydney).
Lecturer in Pathology, The University of Sydney;
Pathologist to the Sydney Hospital.

CLINICAL REPORT.

ENCEPHALITIS LETHARGICA or what I think a better name, epidemic encephalitis, is a disease of widespread extent, invading the brain, medulla and pons by way of the perivascular lymphatics, due according to most authorities to a filterable virus and its toxins. Its clinical features and gravity vary according to the portion of the brain or brain stem which receives the most concentrated invasion. The symptoms upon which the greatest stress has been laid, are those of lethargy, ocular motor paralysis and the Parkinsonian facies. Early in 1920 I encountered a typical case of such. The patient had ptosis with *ophthalmoplegia externa* and *interna*, a masked expressionless facies and she was in a state of stupor, but could be aroused by

being spoken to loudly. She gave a history of double vision some days before, had a rapid pulse and a high temperature. She was sent into hospital, where she died in a few days. Owing to some suspicious circumstances the *post mortem* examination was carried out by the Government Medical Officer. The result I ascertained pointed to what has been termed "X disease."

The following are the histories of patients who came under my care subsequently.

CASE I.

M.W., aged forty years, a female, married. I was called to see her on June 13, 1920. She was suffering from severe headache and vomiting. Her temperature was 40° C. (104° F.), her pulse rate was one hundred and twenty, irregular and intermittent. These symptoms gradually merged into semi-unconsciousness when I sent her into the Sydney Hospital on June 15, 1920, with the provisional diagnosis of *encephalitis lethargica*.

The following is an epitome of the clinical report of her symptoms and progress while there.

On admission she was delirious, at times she could understand what was said to her; she assumed the dorsal decubitus; there was no head retraction. Her pupils were equal and reacted normally to light. There was no evidence of paralysis of any cranial nerve. The knee jerks were slightly exaggerated. There was no ankle clonus and no Kernig sign and the plantar reflex was flexor.

In the circulatory system the only abnormalities found were accentuation of the second sound in the aortic region and an irregular rhythm resembling *pulsus alternans*, suggestive of a left ventricle labouring against resistance.

No abnormality was discovered in either the respiratory system or the alimentary system.

The urine was acid, its specific gravity 1.015. It contained no albumin, no sugar, no pus.

The blood serum did not react to the Wassermann test or to the Widal test. There were 7,800 leucocytes per cubic millimetre of blood, of which 78% were polymorpho-nuclear leucocytes and 22% lymphocytes.

No bacteria were grown in a blood culture.

Lumbar puncture was carried out on June 17, 1920. The cerebro-spinal fluid was under increased pressure and was slightly blood stained; no organisms were grown in culture and no organisms were seen in the smear.

Progress Notes.—On June 16, 1920, the condition was much the same. There was no evidence of any ocular motor paralysis. On June 17 there was definite photophobia. On June 18 the knee jerks were exaggerated; the patient was still comatose; there was twitching of muscles of the left side of the face and of the right arm; there was no oculomotor paralysis and no Kernig's sign. The pulse was irregular, its volume small, its tension low; the heart sounds were weak, coarse crepitations were heard at both bases.

The temperature throughout had been high, ranging between 38.8° C. and 40.8° C. (102° F. and 105.5° F.) and remittent in character.

On June 19, 1920, the pulse was becoming weaker and more irregular; twitchings were still present. Cheyne Stokes's breathing was present. Lumbar puncture yielded no cells, no organisms either in the smear or on culture.

On June 20, 1920, the blood count revealed 4,990,000 erythrocytes per cubic millimetre, hæmoglobin value 90%, colour index 0.9, leucocytes 4,100 per cubic millimetre.

From this time onward the patient became more comatose; the breathing and heart's action more rapid and weak, with occasional twitchings of the face muscles, until finally she became cyanotic; her temperature rose to 40.8° C.; her pulse became imperceptible before death which occurred on June 21, 1920.

Résumé.

The type of acute cerebral symptoms suggested the possibility of acute epidemic encephalitis. In her case lethargy was replaced by delirium, Parkin-

sonian facies by facial twitchings. The cardiac arrhythmia and Cheyne Stokes's respiration pointed to a serious involvement of the medulla. The diagnosis was subsequently confirmed by *post mortem* examination and will be described more in detail by Dr. Inglis.

CASE II.

The second case, that of J.U., was not so clear.

J.U., aged sixty years, a bootmaker, was admitted into Sydney Hospital on May 17, 1920. The history was that he was suddenly taken ill while on his way to work; he lost consciousness and was brought to hospital.

On admission he was found to be in a semiconscious state, but could be aroused when spoken to loudly and became irritable. His attitude was that of dorsal decubitus. He was pale; his temperature 36.1° C. (97° F.); after twelve hours it reached 38.9° C. (101.4° F.).

Nervous System.—In addition to the above his pupils were found to react normally to light; photophobia was present; his knee jerks were exaggerated; Babinski's phenomenon was not elicited; there was no head retraction, no Kernig's sign and no oculomotor paralysis. There was rigidity of both legs and arms, but no paralysis.

Circulatory System.—The heart sounds were weak, but unaccompanied by any abnormal accompaniments. Otherwise the signs were normal.

Respiratory System.—Nothing abnormal was found.

Urinary System.—There was incontinence of urine. The specific gravity of the urine was 1.025, it was acid and contained a slight trace of albumin, but no pus or sugar.

Alimentary System.—His mouth was in an extremely septic condition, with extensive pyorrhœa.

Integumentary System.—There was extensive scarring in the upper third of each leg.

On May 19, 1920, a lumbar puncture was carried out and the cerebro-spinal fluid examined with the following result: Fluid slightly turbid, polymorpho-nuclear leucocytes 38%, lymphocytes 62%. No bacteria were seen in the smear and none were recovered by culture.

On May 21, 1920, lumbar puncture was again performed. The fluid was clear. There was a considerable reduction of Fehling's solution and a faint globulin reaction. No organisms were detected in the smear and there was no growth on culture. The fluid yielded a reaction in the Wassermann test. A few lymphocytes were present.

There was grinding of teeth.

The patient seemed a little better after lumbar puncture. His pulse was irregular and its tension low.

On May 22, 1920, lumbar puncture was performed and thirty cubic centimetres of fluid (one ounce) were withdrawn; the fluid was clear and contained a few lymphocytes.

On May 23, 1920, fifteen cubic centimetres of cerebro-spinal fluid were withdrawn. The patient died at 2.15 p.m.

The temperature throughout was not very high, ranging between 36.6° C. and 39.2° C. (98° F. and 102.6° F.) until just before death when it suddenly rose.

Résumé.

The onset here was acute. He presented the lethargic state; there were no localizing symptoms, but signs of cerebral irritation; his serum yielded a definite Wassermann reaction. Though he was undoubtedly a syphilitic subject, there was evidently some other virus at work causing the acute features. This was also indicated by the presence of 38% polymorpho-nuclear cells in his cerebro-spinal fluid as well as 62% lymphocytes; their presence suggested that one of the invaders at least was some pyogenic organism.

PATHOLOGICAL REPORT.

Case I.

The significant observations made *post mortem* were as follow:

The lungs revealed non-tuberculous broncho-pneumonia.

The heart on both sides contained abundant yellow nucleo-protein clot.

In the liver, spleen and kidneys there was some venous congestion.

The kidneys were not affected by fibrosis.

On removing the *dura mater* much clear fluid was encountered in the meshes of the pia-arachnoid. The vessels were congested on both sides of the brain, especially on the right side. The right temporo-sphenoidal lobe was soft and oedematous and almost diffuent, so that it was removed with difficulty. In this portion of the brain hæmorrhagic points were more numerous than elsewhere. Neither pus nor other gross evidence of meningitis was seen. In stained films from the diffuent areas red blood cells were seen, but no leucocytes nor microorganisms. Stained films of material from other portions of the brain also failed to reveal microorganisms or pus cells. In them, too, only red blood cells and tissue *débris* could be seen.

Figures I. and II illustrate the right temporo-sphenoidal lobe from the surface and after section.

The hæmorrhages in the brain substance are small for the most part, but in the meshes of the pia-arachnoid some rather large extravasations of blood may be seen.

The soft almost diffuent character of the tissue is the result of oedema.

Microscopic Appearances.

The most conspicuous changes are seen in and adjacent to the blood vessels especially in the pia-arachnoid meshes and near the surface of the cortex.

The microphotographs represent appearances seen in the cortex of the right temporo-sphenoidal lobe.

Figure III. depicts a sulcus between two convolutions. Inflammatory cells are present in the small portion of the pia-arachnoid membrane included. The two blood vessels present in the brain substance near its surface are shown more highly magnified in Figures IV. and V. In the wall of the vessel represented in Figure IV. are many inflammatory cells, lymphocytes and plasma cells predominating. Hæmorrhage into the adjacent oedematous brain tissue is conspicuous. Figure V. depicts the other vessel; in its wall round cell accumulation is definite. These cells are mainly lymphocytes, but a few plasma cells are also present. In Figure VI. an arteriole and a venule cut transversely are seen, the arteriole (below) has the thicker wall. The inflammatory cells, mainly lymphocytes, are more numerous around the venule, but the contrast is not very well seen here. The venule is filled with red cells, the arteriole with fibrin.

Figure VII. reveals a venule passing from the substance of the cortex to the surface and an accumulation of inflammatory cells mainly mononuclear cells, but with a few polymorpho-nuclear leucocytes on the outskirts. Oedema of the cerebral tissue is also present.

In Figures VIII. and IX. the histological appearances are seen of that portion of the brain which

was soft and diffuent when removed from the skull. Congestion and hæmorrhage are evident. The oedema has led to great disintegration of the tissue. One vessel is full of fibrin strands, no cells being present in its lumen. There are many such vessels in the section. The large number of nuclei in this area is striking. Some of the cells are lymphocytes and some plasma cells, but polymorpho-nuclear leucocytes are scanty. The majority of the cells have rather large pale nuclei, larger than the nuclei of lymphocytes or plasma cells. These nuclei are either round or oval, sometimes indented. Possibly they belong to proliferated glial cells.

In the sections two types of blood vessels are to be seen. In type one the contents consist of strands of fibrin, but no blood cells, either erythrocytes or leucocytes. As a rule there is no accumulation of lymphocytes and plasma cells around these vessels. There is no hæmorrhage around these vessels, the walls of which are relatively thick. They are probably arterioles.

In type two the contents consist of red blood cells with a few leucocytes and occasionally a few strands of fibrin. Each vessel is surrounded by a ring of lymphocytes and plasma cells and often adjacent to the vessel there is an extravasation of blood into the tissues. The walls are relatively thin. These are probably venules.

Case II.

There were scars just below each knee and on the inner aspect of the right ankle, evidently due to old bone or joint disease, possibly syphilitic.

The lungs were affected by broncho-pneumonia. A large area of the lower lobe of the right lung was gangrenous.

The heart which weighed 368.5 grammes (thirteen ounces), revealed very recent pericarditis. The valves were normal. The muscle of the right ventricle was normal, but in the left ventricle only a thin outer layer, approximately a third of the thickness of the wall, was of normal colour. The colour of the inner two-thirds of the muscle was pale yellow. Atheroma was not present in the aorta, but was rather extensive in the coronary vessels.

The spleen weighed 198.5 grammes (seven ounces) and contained a large recent hæmorrhagic infarct.

The liver weighed 567 grammes (two pounds four ounces); no special change was detected.

The right kidney weighed 170 grammes (six ounces) and the left 113.5 grammes (four ounces). The capsules stripped readily. The pelvic fat was increased in amount, but there was no appreciable fibrosis.

The brain weighed 1,644 grammes (three pounds ten ounces). There was excess of fluid in the pia-arachnoid meshes. The membranes seemed a little thicker and more opaque than usual. The brain was very soft, the posterior portion of the left cerebral hemisphere being almost diffuent. There was very little deviation from normal of the vessels at the base of the brain. Intense cerebritis was present around the softened area and slight cere-

britis in the grey matter of the anterior portion of the cerebrum, especially in the right frontal lobe.

The interpretation of these findings is not simple. I am inclined to think that syphilis, if present, as suggested by the evidence, was incidental and not the cause of death or of the gross lesions revealed *post mortem*. I think there must have been a blood infection of which the portal of entry remains obscure, but was possibly the lung. The lesions in the spleen, brain and heart were probably all infarcts and as no source for emboli was apparent, they were most likely thrombotic. The appearance of some of these lesions much more strongly suggested thrombosis than embolism as a cause.

In the heart lesion probably the microorganism or its toxins acted locally on the small and intermediate sized branches of the coronary vessel and thus led to the formation of many minute thrombi that caused multiple small infarcts which fused laterally to form an extensive layer of dead tissue. The fact that it was the inner portion of muscle that was affected, is in keeping with the anatomical distribution of the coronary artery.

The infarct in the spleen was apparently caused by thrombosis in a single vessel of relatively large size.

There was intense congestion of the left occipital lobe of the cerebrum and hæmorrhage of the cortex and much softening of all tissues including the underlying white matter, but I think the lesion was essentially cortical, the softening of the neighbouring tissue being the result of inflammatory œdema. Some rather large hæmorrhages were present in the cortical substance, but on the surface the hæmorrhages were chiefly small and petechial. It is true that the gross lesion was more or less localized to the occipital lobe and did not involve the grey matter of the entire cerebrum, but careful investigation of the rest of the brain revealed that small numbers of punctiform hæmorrhages were present in the grey matter in the front of the brain, especially in the right frontal region. Further the pericarditis can be explained as additional evidence of a widespread infection.

The concentration of the cerebral effects in the left occipital region may be due to septic thrombosis of a cortical vessel and its branches. Figure

X. represents a thin slice removed from the upper surface of the left hemisphere. The lesion was larger and more extensive than this figure indicates. The limitation of hæmorrhagic foci to the grey matter is well shown.

In Figure XI. the surface of the heart is seen to have lost its normal lustre owing to recent pericarditis. The inner zone of dead heart muscle is clearly defined. This pallor extends into and involves the papillary muscles.

Microscopic.

All the micro-photographs represent appearances to be seen in the cortical grey matter of the left occipital lobe. Figure XII. shows the surface of the brain under low magnification. Inflammatory cells, mainly polymorphs, are very numerous, especially around the vessels that are dilated. Some of the blood vessels have ruptured and as a result blood has become extravasated into the cerebral tissue.

Figure XIII. shows that as in Case I. leucocytes first form a ring around the vessels, the difference being that in this specimen polymorphs predominate.

In Figure XIV. the polymorphs are even more abundant and in Figure XV. they are so numerous as to mask the blood vessels and form a suppurative focus which is almost an abscess.

Figure XVI. shows a rather interesting appearance. Some vessels like this one are not surrounded by inflammatory cells, and seem to be apart from morbid tissue, but in Gram stained preparations, show Gram positive threads in the

tissue adjacent to the vessel. These threads are thought to be probably strands of fibrin.

The explanation offered as to the nature of the cardiac lesion in Case II. was suggested by a specimen that has been in the Sydney Hospital Museum for ten years (see Figure XVII.). In this specimen there is an extensive superficial layer of opaque yellowish tissue with here and there small triangular areas of a similar nature which are separated from the main mass by areas of normal renal cortex.

These triangular areas, I believe, give the clue to the interpretation. They are probably infarcts and represent the unit of change. They are due to

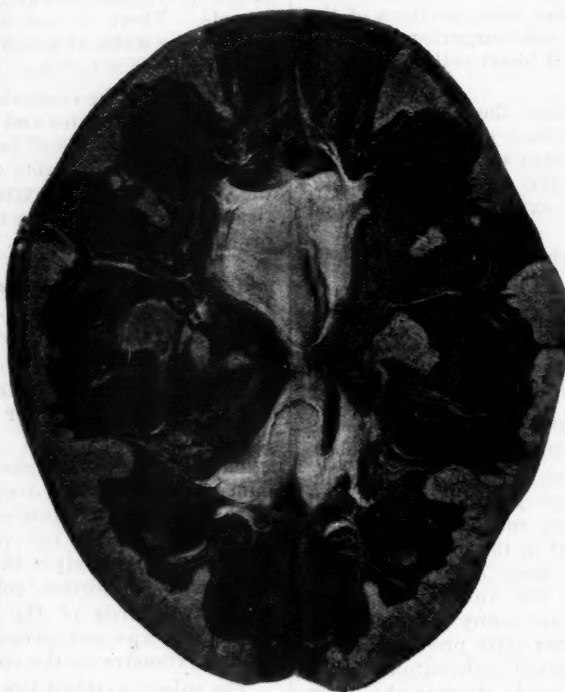


FIGURE XVII.—A kidney showing a zone of necrotic tissue probably due to lateral fusion of many small infarcts like those in the upper half of the figure.

occlusion of intermediate sized branches of the renal artery and when adjacent infarcts fuse at their margins, the end result is not a large wedge-shaped infarct such as forms when a large vessel is occluded, but a flat zone of necrotic tissue. From the *post mortem* notes in this instance it appears that there was no evidence of recent endocarditis and no other likely cause of embolism. In any case taken on its own merits the kidney lesion is much better explained as the result of multiple thrombosis than multiple embolism.

At the Australasian Medical Congress (British Medical Association) held at Melbourne in 1923 I stated that during the previous three years *post mortem* examinations on eight bodies of patients who had suffered from a disease clinically regarded as *encephalitis lethargica*, had come under my notice. In only one of them was the histological picture similar to that described by European and American observers as occurring in *encephalitis lethargica*. Case I. in the present series is the one referred to. Though the hæmorrhages are more evident than in the classical description, still the clinical and histological pictures are consistent with a diagnosis of *encephalitis lethargica*. I say consistent advisedly, because I think that a similar histological picture may be produced by several ætiological agents. For instance, the rings of lymphocytes around the blood vessels to which much attention is paid in *encephalitis lethargica*, are well seen in the brains of patients who have suffered from relapsing fever or some forms of cerebral syphilis. The mononuclear reaction is a form of response which may be caused by many ætiological agents, just as the polymorpho-nuclear response may be caused by streptococci, staphylococci and many other varieties of bacteria.

Case II. is, of course, not an example of *encephalitis lethargica*, but as it offers such a striking histological contrast with Case I. and presents some features which are unusual and difficult of interpretation, it is regarded as of sufficient interest to be recorded.

I am inclined to think that infarction as a result of thrombosis of vessels of small and medium size is of much more frequent occurrence than is usually supposed.

I wish to acknowledge my indebtedness to Dr. Oliver Latham for his assistance in the histological examination of these two brains.

LEGENDS TO ILLUSTRATIONS (SEE ART SUPPLEMENT).

CASE I.

FIGURE I.—Right temporo-sphenoidal lobe seen from the surface.

FIGURE II.—Right temporo-sphenoidal lobe showing the cut surface.

FIGURE III. $\times 60$.—Sulcus between two convolutions of the right temporo-sphenoidal lobe. The two blood vessels in the brain substance are shown more highly magnified in Figures IV. and V.

FIGURES IV. and V. $\times 250$.—Two vessels (shown in Figure III.) in the cortex of the right temporo-sphenoidal lobe.

FIGURE VI. $\times 250$.—An arteriole and venule in cross section. The arteriole (below) is filled with fibrin and has the thicker wall. The venule is filled with red blood cells.

FIGURE VII. $\times 125$.—A cortical vessel surrounded by an inflammatory zone.

FIGURE VIII. $\times 60$ and FIGURE IX. $\times 125$.—An area of cortex showing œdema, hæmorrhage and considerable accumulation of inflammatory cells.

CASE II.

FIGURE X.—Left cerebral hemisphere showing softening of occipital lobe with hæmorrhagic foci limited to the cortical grey matter.

FIGURE XI.—Heart. Dulling of lustre of the visceral pericardium is due to recent pericarditis. The inner zone of pale necrotic muscle is clearly defined.

FIGURE XII.—Surface of occipital lobe showing inflammatory changes in the grey matter.

FIGURE XIII.—A cuff of inflammatory cells (mainly polymorpho-nuclear cells) around a blood vessel.

FIGURE XIV.—Polymorphonuclear cells more abundant.

FIGURE XV.—Polymorphonuclear cells so numerous as to mask the vessel. They form a suppurative focus which is almost an abscess.

FIGURE XVI.—Fibrin strands in cerebral tissue adjacent to a vessel which has no inflammatory cell mantle.

FIGURE XVI. is from a section stained by Gram's method. All the other microphotographs are from sections stained by hæmatoxylin and eosin.

THE STAINING OF INTERCELLULAR SUBSTANCE: PRELIMINARY COMMUNICATION.

By JAMES M. PETRIE, D.Sc., F.I.C.,

Bosch Cancer Research Fellow.

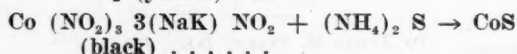
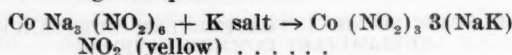
From the Department of Physiology, University of Sydney.

SINCE the time of von Recklinghausen histologists have made use of a number of empirical methods for making visible the intercellular "ground substance" of epithelial tissue. That this intercellular substance is distinct from the cell protoplasm was first recognized by Flinzer in 1854. Flinzer and His after impregnating the cornea with fused silver nitrate saw that silver salt was precipitated between the cells and the latter, having found that the deposit was always outside the cells, thought he had discovered extracellular lymph spaces. Then in 1860 von Recklinghausen enlarged on these observations and worked out a histological method for examining various tissues. This consisted in treatment with solutions of silver nitrate and sodium chloride, with subsequent exposure to sunlight. The outlines of endothelial cells were thus clearly shown as black lines. This technique was varied and improved by eminent histologists such as Müller, Ranvier, Krauss, Golgi and subsequently by others. Other substances have also been used, such as methylene blue with ammonium picrate, which Dogiel in 1889 showed to be capable of staining intercellular substance.

Whether the deposit is due to a protein precipitate or to silver chloride darkened by light or both together, this method of showing the outlines of endothelial cells by blackening the "cement substance" of the histologists is entirely an empirical one. It can now be demonstrated that the intercellular material forming the semifluid "ground substance" in certain endothelial tissues can be stained and made visible by a well understood and accurately defined chemical reaction. As will be shown, this is due to the presence of a potassium compound in the intercellular cement substance. The potassium is identified by the formation of an insoluble precipitate with the double salt cobalt sodium nitrite which can be distinctly seen in prepared sections, and also identified by chemical means.

In the case of serous membranes the method is carried out by laying the fresh tissue on a slide and

after it has slightly adhered by drying, it is treated with the cobalt reagent. After a certain time the slide is washed with ice-cold water till the excess of reagent is completely removed. If the slide be now examined under the microscope, the outline of the cells, that is the intercellular substance, is seen to be formed of yellow precipitate, which is the triple salt of cobalt sodium potassium nitrite; when the preparation is subsequently treated with ammonium sulphide, this yellow compound is changed to black cobalt sulphide, which is permanent. The black deposit has replaced the yellow precipitate and indicates the location of potassium in the original specimen.



By this method of microchemical technique, that is by staining for potassium, the "ground substance" is developed with great distinctness. The intercellular cement of the pavement endothelium of serous membranes is sharply defined. The outlines of the characteristic cells are seen as irregular black lines, resembling the appearance of cells stained with silver nitrate and blackened by sunlight. The endothelial cells covering mesentery, omentum, the central tendon of the diaphragm, pericardium and the interior of blood and lymphatic vessels are brought out prominently and clearly by this method and in all these the potassium is shown to be concentrated in the intercellular ground substance.

The writer wishes to take this opportunity of thanking Professor Burkitt for providing special laboratory facilities and also Professor Chapman for many suggestions and advice.

The illustrations which are from micro-photographs, are pictures in black cobalt sulphide and show where the potassium was located in the original tissue.

Reviews.

AN HISTORICAL INVESTIGATION.

THE history of Medicine is receiving increasing attention during the past twenty years and in recent years a number of studies have been put forward by John Bale, Sons and Danielsson, including the delightful "Medical Classics" series edited by Dr. Charles Singer. This particular volume is apparently the first of a series of studies in the sexual life of ancient and mediæval peoples projected by the author, E. J. Dingwall. The title is mystifying and intriguing and the book is a most painstaking and thorough review of attempts at artificial methods to insure chastity in certain males not only among the Græco-Romans, but also many other primitive peoples. Infibulation (*fibula* = a broochpin) is strictly the method adopted by the Greeks and Romans of partially closing up the prepuce by a sort of safety-pin and was especially designed for singers and comedy artists who were apparently much desired by certain women, but who were thought to spoil

their voices by the practice of sexual intercourse. We imagine that the method, whether desirable or not, would hardly recommend itself to modern artists. Besides the singers, musicians and actors, performers in the palestra (the boxers, wrestlers and athletes) together with youths and schoolboys and others in whom continence was considered desirable, were infibulated. Other similar devices were adopted such as the creation of an artificial phimosis by sewing a ring just within the preputial opening or by a ligature curiously termed a dog chain. This explains the typical constriction shown in this position in the Greek athletes pictured on ancient vases. Apparently as the athlete stripped off all his clothing before exercise the prevention of the exposure of the glans was his only possible contribution to modesty.

Such practices the author points out are closely allied to Methods in Ancient Egypt and among the Kaffirs and the Polynesians of today to protect the glans by sheaths and ligatures. The interesting idea that both Egyptian and Kaffir found this a protection against Bilharzia infection is thought improbable by Dingwall.

Devices for this purpose seem to have existed all over the globe, while in modern times they have been used by surgeons in the treatment of masturbation and of sex aberration. Distinct from these but similar in idea, are the various methods to prevent seminal emission just before the day of the contest, practised even nowadays by athletes.

The book is full of excellent references and comprehensive in treatment. While the subject of sexual practices is difficult to deal with, so slender is the margin here between the obscene and the scientific, the author has handled his material successfully. Many have suffered from the practice even in scientific treatises of putting into Latin or French or in selected footnotes facts relating to the sexual life of man and will sympathize with his standpoint that the far-reaching importance of the sexual life and the influence of the sexes on one another, cannot be over-estimated. He quotes in support Frazer's statement that "the study of the various forms, some gross and palpable, some subtle and elusive, in which the sexual instinct has moulded the religious consciousness of our race, is one of the most interesting, as it is one of the most difficult and delicate tasks which await the future historians of religion" and we may add "and medicine." The author is to be congratulated on his learned and interesting account of a most curious yet important phase of human behaviour.

RETINAL THROMBOSIS.

FOSTER MOORE, of London, has made a careful study of sixty-five cases of retinal venous thrombosis.¹ The author who was the Lang Research Scholar for 1913, began his researches in that year, but was interrupted by the war. His readers are the gainers by this, in that he has been able to follow up the career and medical history of his patients for a period of about eleven years. The study is mainly an academic one and will prove interesting to the ophthalmoscopic student. Several practical observations, however, emerge. One is that it is usual for the tension of the affected eye to be lower than that of the other and that when it is equal or higher, there is good reason to expect the onset of acute glaucoma sooner or later. Another useful point brought out is that in his series of cases the average duration of life after the development of venous thrombosis was 5.8 years. The only immediate symptom of the condition is defect of sight, partial when a tributary vein only is involved and complete when the central vein is thrombosed. Though some improvement of vision may take place through collateral channels being established or canalization of the clot, the vision mostly is permanently and seriously damaged.

¹ "Male Infibulation," by Eric John Dingwall, M.A.: 1925. London: John Bale, Sons & Danielsson, Limited. Crown 8vo., pp. 145, with illustrations. Price: 10s. 6d. net.

¹ "Retinal Venous Thrombosis: A Clinical Study of Sixty-two Cases Followed Over Many Years," by R. Foster Moore, Lang Research Scholar, 1913; 1924. London: George Fulman & Sons, Limited. Royal 8vo., pp. 90.

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A Retrospect.

Biological Chemistry.

The intense activity in the sphere of biological chemistry not only in physiological laboratories, but also in the laboratories of applied chemistry accounts for the large production of published papers during the past year. The object of the majority of the investigations is to provide simpler, more rapid and more accurate methods of analysis and of estimation, to determine more exactly the character of phenomena dependent on chemical changes or to give more detailed accounts of the chemical processes associated with living things.

Several studies have been completed in regard to the solubility of salts of lime in blood, in plasma, in serum and in body fluids. This subject is of importance in connexion with the process of calcification. The investigators have employed methods of greater precision than those previously used in this class of work and have adopted the technique of the physical chemists. It has been proved that the concentration of phosphate ions in decreasing the capacity of body fluids to hold calcium in solution plays a large part in calcification. An important fact has been brought to light in this connexion. Sections of the bones of young animals and of rachitic animals have been made to calcify by immersion in suitable fluids *in vitro*.

Some useful work has been carried out by R. Hill on the spectra of hæmoglobins and of metallo-hæmatoporphyrins. This research has revealed many of the factors concerned in the production of the various two-banded absorption spectra of the blood pigments.

A. V. Hill, Long, Lupton and Furusawa have examined the relations of muscular exercise to the lactic acid content of the blood and to the supply and utilization of oxygen. Their articles record

the results of work extending over three years conducted partly in Manchester and partly in London. They have found that there is but a slight alteration in the concentration of lactic acid in the blood during moderate muscular exercise. During and after severe exercise there is a relatively large increase in the concentration of lactic acid in the blood. This increase gives rise to important effects on the hydrogen ion concentration and on the oxygen and carbon dioxide dissociation curves of the blood. The concentration of lactic acid in plasma is approximately 30% greater than that in whole blood, which means that the blood corpuscles have a low lactic acid content. The muscles therefore are readily brought into equilibrium with the plasma as far as lactic acid is concerned. During exercise the respiratory quotient rises in proportion to the strenuousness of the muscular effort. It continues to rise after severe exercise during the first fifteen minutes of recovery. The process of recovery appears to be complete in about ninety minutes. The only genuine metabolic effect following exercise is a displacement of the respiratory quotient. This displacement manifests itself in the oxidation of less carbohydrate and of less fat. It occurs after the ninety minutes of recovery.

Numerous researches into the nutrition of rachitic and lactating animals have been carried out. The remarkable effects of sunlight and of ultra-violet radiation from mercury vapour lamps upon animals and their food have excited widespread interest. It is still too early to pronounce an opinion on the rôle of radiations in the problem of nutrition. It appears that there is a variable loss in the amount of water-soluble vitamin B in milk that has been subjected to the process of desiccation. It is, however, uncertain how far the several factors and processes are responsible for this change in the dried milks. In regard to the more important fat-soluble vitamin A there is little evidence of any change during the processes of desiccation.

In regard to the metabolism of protein some work has been done on the effect of administering amino acids upon the amino acid content of the blood. Lusk has put forward the hypothesis that the increased heat production of the animal body follow-

ing the ingestion of alanine and glycine is not due to the oxidation of these amino acids or their metabolites, but is due to a chemical stimulation of the cells of the body to a higher level of metabolism. The specific dynamic action of an amino acid is proportional to its power of increasing the amino nitrogen content of the blood. So far no definite evidence has been collected of the mode in which the concentration of amino nitrogen in the blood increases the heat output of the body.

Hygiene.

The most important happening of the past year in regard to hygiene in Australia is the publication of the report of the Royal Commission on Health. This masterly survey of the position in practically every branch of hygiene is all the more remarkable on account of the reasonableness of the recommendations. That five experts should investigate within the short span of twelve months almost every problem affecting the health of the community in a vast continent and elucidate the defects and shortcomings of the complicated set of systems obtaining at present, is a great achievement. That these five persons should resist the temptation of suggesting radical and impracticable reforms is more surprising, in view of the state of affairs. That they should have found agreement in their selection of remedies without having recourse to a single contentious expedient is perhaps the most praiseworthy aspect of this great report.

The International Labour Office of the League of Nations has continued its good work begun so auspiciously five and a half years ago. This body and the Health Organization of the League have carried out some highly important pieces of work. The publication of the legislative bases and methods of administration of the health services in various countries must tend to the wide adoption of improved measures of protection. The British Ministry of Health as usual has made available to all who are concerned with hygiene, much valuable information. The tendency of the annual reports of the Chief Medical Officer and of the Department is to stimulate interest in the prophylaxis of disease and in the awakening of the ambition of local authorities

and of the members of small communities to clean up the Augean stables.

Some excellent work has been carried out in connexion with the protection of eyesight and management of illumination. In industrial conditions illumination is being assessed at its true value. A special report on this subject has been issued by the Industrial Hygiene Section of the International Labour Office. It has been recognized that insufficient lighting is the cause of at least one-quarter of all accidents. The avoidance of undue glare and the elimination of heavy shadows are insisted on, while it is recognized that every part of the modern factory should be flooded with light, whether natural or artificial. In the case of miners the question of nystagmus resulting from bad illumination has also attracted much attention.

The subject of national schemes of health insurance has been prominently before the medical profession and the public during the year. While there appears to be a general disinclination to adopt the hazardous policy of medical benefit, measures for the control of particular infective diseases are encouraged and are being adopted. Tuberculosis, diphtheria, anthrax, anchylostomiasis and many other diseases are being vigorously attacked. The campaign directed toward the reduction of maternal and infantile mortality has been commented on in another chapter of this retrospect. The key note of all these endeavours is the cooperation of the practising part of the medical profession with the health authorities.

In industrial hygiene occupational therapy is advancing steadily. D. G. Robertson has published an excellent official report on the position of industrial hygiene in Australia. The number of medical advisers to large industrial firms is increasing and the result is a definite improvement of the health of the worker. The value of a pleasant and healthy environment and of comfortable conditions of work is widely recognized, while the question of the elimination of avoidable fatigue in industry has been brought prominently before employers of labour. The sanatorium scheme and the village settlement plan are receiving attention both in Great Britain and in the United States of America.

Vocational training for the tuberculous and for persons physically or mentally unfitted for city life is an accomplished fact.

The dangers of certain occupations have been studied. The occurrence of silicosis and of lead poisoning continues to attract the attention of experts in all parts of the world. Grace Burnham has pointed out that there is a grave risk of carbon monoxide poisoning in garages and motor car repair shops, while Dorothy Minster has collected evidence concerning the frequency of anthrax, cyanide poisoning, infection by parasitic fungi, arsenic poisoning, the damaging effects of the inhalation of leather dust, naphtha, benzol and carbon monoxide poisoning in tanneries. In these investigations as well as in others it has been ascertained that the hazards of dust inhalation can be reduced to a minimum by properly constructed and adjusted devices.

Harrison has called attention to some aspects of death from electric shock. The possibility of restoration after apparent death from electric shock is emphasized. Palmer and Doherty have endeavoured to test the doctrine enunciated by Gettler that in drowning in salt water the blood in the left side of the heart contains considerably more chloride than does the blood in the right side. Their results indicate that while this difference is encountered in some instances, it is absent in others. They conclude that Gettler's doctrine cannot be accepted in its entirety.

Current Comment.

THE MELANOMATA.

Few subjects have led to greater divergence of opinion than that concerned with the nature and origin of melanomata. Perusal of the literature leaves the student confused and uncertain. While one group of investigators has stated that the melanomata are essentially epithelial structures and another has claimed for them mesoblastic origin, some regard them as arising from both sources and others again think that some forms of melanomata have sprung from endothelial structures. So pronounced is the difference of opinion that Ewing in

his well-known textbook confesses his inability to reach a conclusion regarding the nature of melanomata. Apparently, however, he is inclined to accept the view that they are of mesoblastic origin, for in his opening sentence he defines a melanoma as a pigmentiferous tumour arising from a specific mesoblastic cell, the chromatophore, and possibly also from pigment cells which have been modified by pigment production.

Virchow described sarcomatous melanomata characterized by a diffuse structure of spindle cells and carcinomatous melanomata with an alveolar structure. Von Recklinghausen in 1882 adopted the view that melanomata arise from the endothelium of the lymph channels. His investigations were concerned mainly with fibrous naevi. He was unable to trace any transition of capillary endothelium into masses of naevus cells. Unna was the first protagonist of an epithelial origin for melanomata. He regarded the naevus cells as epithelial cells. He traced a direct connexion between epithelial and naevus cells and he drew attention to the tendency towards complete isolation of groups of altered epithelial cells in the connective tissue of the derma. Ribbert advanced the mesoblastic view. He held that melanomata arise from a highly specialized mesodermal cell which he called the chromatophore. He regarded this cell as a pigment-forming cell and the non-pigmented cells in the cell columns of naevi as immature chromatophores or as chromatophores which had become depigmented. He carried this view to its logical conclusion as far as the intra-epidermal cell nests are concerned, for according to his view these are the result of penetration from below by the proliferating cells. Yet another manner in which the melanomata have been held to arise is that advanced by Kromayer. Kromayer saw as others have done that in all probability the naevus cell takes some part in the formation of the connective tissue which surrounds it. He regarded the naevus cell as of epithelial origin, but suggested that the epithelial cell is completely transformed, so that it not only becomes similar morphologically to a connective tissue cell, but functions as the latter type of cell and produces fibrils. In other words he held that the epithelial cell undergoes a dedifferentiation and this is followed by a redifferentiation—a process which has been termed desmoplasia. The effect of such a process is that an epithelial cell becomes a connective tissue cell and a tumour composed of these cells is to all intents and purposes a connective tissue tumour. Such a heterodox conception strikes a blow at the accepted view of the specificity of the germinal layers of the embryo.

Such are the main conceptions which have been formed as to the nature of melanomata. Many elaborations of these doctrines have been made and the name of their proponents is legion. Additional work has been done on this subject recently and some of it is of considerable importance. It is well that it should be examined and recorded.

Dr. David T. Smith has investigated melanotic tumours and claims to have found evidence that they may arise from one of two distinct types of

pigment cell.¹ He refers to the work of Luna in 1917 on tissue culture. This observer cultivated the pigmented epithelium of the retina of the embryo chick's eye in plasma cultures. He noted that the cells grow in sheets like epithelium. This observation has been confirmed by Dr. Smith. He points out that cultures of retinal cells, grown in successive generations for over three months at the Rockefeller Institute, have retained their epithelial character. In the chorioid, iris and ciliary bodies isolated pigment cells of quite a different appearance are found. They have long processes which are often branched. Luna has also shown that these cells may be grown in plasma as isolated cells like fibroblasts and not in sheets like epithelium. Dr. Smith's cultures were grown in Locke-Lewis's solution and he is quite satisfied that the pigment cells described by him are of two distinct types. Even though the cells were different in appearance and manifested great variation in the size and shape of the granules, he lays stress on the fact that the granules in any particular cell under observation were always about the same size, shape and colour and were evenly distributed throughout the cytoplasm. When granules of pigments had been ingested by cells not normally pigmented, the picture was different. The pigment being a foreign body, the cell reacted in such a manner that the granules were clumped into masses of irregular size and shape. By this means it is possible to determine whether the cell is a pigment producing or a pigment carrying cell.

Dr. Smith determined to seek for evidence which would indicate that the connective tissue type of cell might arise by metaplasia from the epithelial type or *vice versa* or whether both were derived from a common parent cell. It is known that the pigment cells of the retinal part of the iris (these cells are epithelial in origin) "bud" down into the mesothelial tissue beneath, lose their pigment granules and form the muscle cells of the iris. Sections of this region were studied for evidence that other pigment cells from the epithelial layer might be changed into pigment cells of the connective tissue type. No such evidence was found, though the "bud" of the epithelial cells with loss of the large round granules and the formation of muscle could be followed. No transitional stages could be found either in the type of cell or in the character of the granules. Dr. Smith regards it as quite clear that the connective tissue type of cell arises *in situ* and entirely distinct and separate from that of the epithelial type. At first the granules are very small and light in colour, but as the cell matures the granules become larger and darker. Two hundred and fifty benign moles of the skin were examined. Of these 96% were composed of cells of the epithelial type and this is regarded as confirming the conclusion of Unna that the common moles of the skin are epithelial in origin. An entirely different picture was presented in 4% of the lesions. The lesion

was in the dermis and was composed of long spindle-shaped cells, some of which manifested branching processes. Their morphology was such that they appeared to be identical with the pigment cells of the chorioid and Dr. Smith thinks that they were probably the "chromatophores" which Ribbert erroneously considered to be the cause of all pigmented moles."

Dr. F. Darier has also discussed at some length what he terms the malignant mesenchymatous melanoma or melano-sarcoma.¹ He holds that it has been demonstrated that in certain pigmented areas which may be seen in adults and in children, pigment is produced by connective tissue cells of mesenchymatous origin. These cells form what he terms "blue naevi" and frequently undergo malignant change. On account of their appearance and resemblance to naevo-carcinomata which are of epithelial origin, the resulting tumours have frequently been confused with naevo-carcinomata. The recognition by other observers of the mesenchymatous character of the pigment cells and histological appearance of the cells in sections of "blue naevi" studied by himself are apparently Dr. Darier's reasons for regarding the tumour as of mesenchymatous origin. He points out that the pigmentation extends as far in an outward direction as the neighbourhood of the papillary body or in other words to that portion of the skin which is limited below by the subpapillary vascular plexus, but that it never invades this area. With the high power isolated pigment cells can be seen in the papillary body, but these are not more numerous than in normally pigmented skin. The epidermis is normal, its basal layer does not contain excess of pigment and in none of his sections was Dr. Darier able to find cells such as are characteristic of freckles, soft warts or naevo-carcinomata.

Dr. Darier further discusses the question as to whether the cells of his malignant mesenchymatous melanomata are pigment producing or pigment carrying cells, melanoblasts or melanophores. In this connexion he refers to the work of Bloch in regard to the so-called "Dopa" reaction. Bloch used an agent known as dioxy-phenyl-alanine (shortened to "Dopa"). This is a derivative of pyrocatechine and is related to adrenalin. He showed that certain cells of pigmented regions contain an oxydase. When this comes in contact with "Dopa" in tissue sections, a precipitation of pigment occurs. Dr. Darier points out that the reaction takes place in cells in which the pigment has not yet been formed, in other words the cells yielding the reaction, the "Dopa-positive" cells, are undoubtedly melanoblasts. The pigmented cells of "blue naevi," the cells which by undergoing malignant change give rise to the "malignant mesenchymatous melanoma," have been shown to be "Dopa-positive" and hence these cells are melanoblasts and not melanophores. Reference will be made again to Bloch's findings in dealing with the important work of Dr. J. W. Dawson.

¹ Bulletin of the Johns Hopkins Hospital, March, 1925.

¹ Bulletin de l'Association Française pour l'Étude du Cancer, May, 1925.

Dr. J. W. Dawson has published a lengthy and comprehensive study of the melanomata.¹ His monograph covers over two hundred pages and is accompanied by many excellent coloured plates and photomicrographs. A whole issue of the *Edinburgh Medical Journal* has been devoted to it. Dr. Dawson has included in his work the whole gamut of melanotic tumours and has come to the conclusion that all are of epithelial origin. He traces the development of a benign melanoma and illustrates it by a series of photomicrographs taken from tumours in successive stages. The cells of the *rete Malpighii* lose their intercellular fibrils, become detached and actively proliferative and assume a spindle or star-shaped form. Finally the cell group or its component cells break through the transition zone between epidermis and corium, leaving the superficial layer to heal up, while they migrate and settle in the upper part of the corium. These cells are small, almost atrophic cells and are the first evidence of the so-called naevus cells. They are separated by a varying amount of connective tissue from each other and are usually arranged in cell columns or groups or nests. In the connective tissue there are also seen branching cells containing pigment. The cells in the corium are separated from the epidermis of a narrow zone of almost homogeneous connective tissue. Dr. Dawson points out that it was this arrangement in columns and groups which first led von Recklinghausen to trace their origin to the lymph channel endothelium and the presence of the pigmented and non-pigmented cells lying side by side has given rise to the view of the dual origin of tumours that may arise from such naevi. As a result of examination of more advanced types of naevi Dr. Dawson comes to the conclusion which he emphasizes repeatedly, that both types of tumour cell, pigmented and unpigmented, arise from the groups of cells or cell nests within the interpapillary epithelial processes.

It is obviously impossible in a short space to describe the histological appearances seen by Dr. Dawson in tumours of each melanotic type. Reference must be made, however, to melanotic tumours of the chorioid, for tumours of this region have given rise to much difference of opinion. Dr. Dawson points out that pigmented cells of the chorioid may have two possible origins. They may be the result of migration of cells of the retinal pigmented layer into the chorioid (the retina is of ectodermal and the chorioid of mesodermal origin). The chorioid in these circumstances would be the corium of the retina. The other possibility is that the stroma cells of the chorioid may ingest the free granules which are an overflow from the retina. It is necessary to point out that all pigmented tumours of the chorioid are not melanomata. Tumours may be coloured by blood pigment and a malignant new growth whose cells had ingested loose pigment, would not be a melanoma, unless the pigment were found in its metastases. Dr. Dawson mentions the work of Dr.

Smith to which reference has already been made in this article. He discusses the possible dual origin of melanotic chorioidal tumours. He points out that the inner coat of the eye, that is the retina including the pigment epithelium and its anterior prolongations, the *pars ciliaris retinae* and *pars iridica retinae* originate from the secondary optic vesicle and that this arises as an invagination of the pouch of the neural tube. The pigmented cells of the chorioid, therefore, are not mesoblastic, but neuro-epithelial in origin. He holds, moreover, that though their function round the vessels of the outer layer of the chorioid is not decided, their stability as pigment producing cells must be admitted—they are not merely chromatophores (melanophores), but melanoblasts.

Another battle ground in regard to melanomata must be discussed, namely the so-called melanomasarcomata. Dr. Darier's "malignant mesenchymatous melanoma" will belong to tumours of this group. Dr. Dawson points out that in one of his sections all stages of the transition could be followed between the naevus cell groups with round or oval nuclei and little cytoplasm to more elongated and increased cytoplasmic elements and further to definite strands of spindle-shaped elements; "it almost seemed as if each cell column had formed one of the latter interweaving strands." Reference has already been made to the process known as desmoplasia and to Kromayer's view of its application to melanomata. Dr. Dawson is not in agreement with Kromayer that the epithelial cells undergo a desmoplasia, that is become connective tissue cells and give rise to a tumour which is a sarcoma or fibrosarcoma. At the same time he holds that Kromayer's view "cannot be lightly dismissed." He points out that the acceptance of such a view implies "an extreme violation of the laws of histogenesis." All that Dr. Dawson will admit is the extreme morphological differentiation which an epithelial cell may undergo under certain conditions of growth and environment.

In conclusion it is interesting to note Dr. Dawson's references to Bloch's work. His reference is very similar to that of Dr. Darier, but he makes one significant statement. He states that Bloch has maintained that if a cell gives a "Dopa" reaction, it is genetically related to the epidermis. If this is so, some of Dr. Darier's conclusions are valueless.

The study of the melanomata is of extreme importance. The changes occur as a rule in the skin and lend themselves to critical examination and research. The work here reviewed is valuable. That of Dr. Dawson is of outstanding merit. He has conducted his examinations with great care and has advanced a self-contained and concise argument. At the same time his conclusions are consistent and fearless. His work demands the careful attention of all who are interested in the growth and function of the human body either in its normal or abnormal state.

¹ *Edinburgh Medical Journal*, October, 1925.

Abstracts from Current Medical Literature.

DERMATOLOGY.

Rhus Dermatitis.

R. H. CLOCK (*Medical Journal and Record*, July 19, 1925) reports a series of patients treated with the almond oil extract of *Rhus* and comes to the following conclusions. All persons are susceptible in some degree to poisoning and actual contact with the sap of the plant is necessary to produce dermatitis. Such contact may result through some intermediary agent which carries the sap. Alcoholic extracts of poison ivy cause a painful local reaction which is undoubtedly due to the high percentage of alcohol used to hold the active principle in solution. Poison ivy extract in almond oil contains the purified active principle of *Rhus toxicodendron*, freed from colouring matter and inert water soluble substances. Laboratory tests show that the almond oil extract is more potent than other extracts and can be injected without pain or local reaction. Relief generally follows in twelve to twenty-four hours after first dose.

The Relationship of Syphilis to Other Skin Diseases.

R. W. MACKENNA (*British Journal of Dermatology and Syphilis*, November, 1925) remarks how seldom it is that syphilis is found associated with other dermatoses. For the purposes of his paper he had a Wassermann test done on every patient attending his dermatological out-patient department for the first time. Only three or four yielded a reaction, which is relatively low compared with figures from other hospital departments. He notes the extraordinary power of syphilis to imitate other skin lesions and instances amongst others yaws, sporotrichosis, *erythema nodosum*, leucoderma, psoriasis. He does not agree with the French school that vitiligo or idiopathic leucoderma and *alopecia areata* have any origin in syphilis. In no case of these did he get a positive response to the Wassermann test. Of nine first patients suffering from psoriasis with no history of psoriasis in any previous generations of the family one only yielded a reaction to the Wassermann test. The author then discusses the effect of syphilis on pus infections and inflammatory infections of the skin, such as sycosis and eczema and states that if the spirochætal infection is active, it will superimpose upon the lesions of the simpler disease lesions conforming in type to the stage of its own evolution. As an example, he mentions the appearance of condylomata under the breasts and in the umbilicus in patients with secondary syphilis suffering from eczema in these regions, also the alteration of the indeterminate border of an ordinary eczema

into a definitely margined edge in a patient suffering from tertiary syphilis. In association with the major diseases such as cancer, leprosy and lupus, syphilis seems to increase their destructive power. Passing on to congenital syphilis he cannot find that an heredo-syphilitic is any more liable to skin diseases than a normal child. Finally while there is not sufficient evidence to blame hereditary syphilis for scleroderma, keratoderma of hands and feet, ichthyosis, parakeratosis, parapsoriasis and *epidermolysis bullosa*, he describes the following case: A man and wife both had florid syphilis at the time of their marriage. Their two full-time children both developed ichthyosis together with definite luetic stigmata. No ancestor on either side had suffered from ichthyosis.

Poikiloderma Atrophicans Vasculare.

C. RASCH (*British Journal of Dermatology and Syphilis*, November, 1925) describes a case of *poikiloderma atrophicans vasculare*, which corresponds in some degree with Jacobi's case. He regards the condition in both his and Jacobi's cases as an atypical form of *lupus erythematosus*. The disease commenced as a "mild eczema" thirty-eight years previously on the face of a man, sixty-one years of age. The condition had spread until both cheeks and chin were affected with scattered lesions on the neck, scalp, ears and fingers. The body was also the site of widespread skin changes extending from the scapula to sacral region round on to the abdomen in front. There was a patch of leucoplakia on the hard palate. The lesions were of an infiltrated, erythematous nature with scales, telangiectasis and scar formation. On first appearance the condition suggested X ray dermatitis as the patient kept the skin free from crust and scales by the free application of oil. By this means he was able to keep down a certain amount of the irritability which was present. There were several points in which the author's case does not correspond with that reported by Jacobi, namely absence of hereditary history, pigmentation, nail changes and muscular atrophy. The histological picture was not antagonistic to the view that the condition in both these cases was an atypical form of *lupus erythematosus*.

Genital Gangrene Treated by "Novarsenobenzol."

O. JERSILD (*Annales de Dermatologie et Syphiligraphie*, November, 1925) describes nine cases of genital gangrene successfully treated with "Novarsenobenzol." Following on the good results obtained by treating Vincent's angina with intravenous injections of arsenic, it was considered that other lesions caused by the combined forces of spirilla and the fusiform bacilli would yield equally good results. After an incubation period of four to seven days a gangrenous, foetid

ulcer appeared generally near the base of the *glans penis*. General symptoms developed (headache and fever), the temperature rising to 39° or 40° C. In most of the cases one intravenous injection of "Novarsenobenzol" was sufficient to cause almost immediate improvement. The temperature dropped and pain disappeared within a couple of days, followed soon after by demarcation of the slough. The temperature and general symptoms improved so promptly that the author regarded the actions of these preparations as almost specific in this condition.

Ætiology of Granuloma Inguinale.

L. H. CORNWALL and S. M. PECK (*Archives of Dermatology and Syphilology*, November, 1925) describes in detail three cases of the *granuloma inguinale* in negroes with special reference to the ætiology. In direct smears and those obtained from culturing on Sabourand's medium the organisms were found to be best demonstrated. The organism described exhibits definite pleomorphism. Some resembled short diplobacilli, others had the morphological characters of cocci, diplococci and even full grown bacilli. Some were intracellular, others extracellular. Animal inoculation (intradermal) was carried out and similar Gram-positive pleomorphic organisms were obtained by culture from the resulting lesions. In all three cases similar organisms were obtained. These had the characteristic structural appearance in young cultures in Sabourand's medium. This morphological appearance disappears in old cultures and is not reproduced in subculture. With reference to treatment these patients had shown considerable improvement by the intravenous administration of tartar emetic. Treatment was commenced with two cubic centimetres of a 1% solution and increased by one cubic centimetre every second day until a dose of six or eight cubic centimetres was reached.

Tubercle Bacillus as an Ætiological Factor in Lupus Erythematosus.

A. B. CANNON and G. G. ORNSTEIN (*Archives of Dermatology and Syphilology*, November, 1925) have added another contribution to the study of the causal factor in *lupus erythematosus*. Although most dermatologists now regard this condition as a cutaneous symptom produced by a variety of toxic agents, there are still some who think that the tubercle bacillus has an important relationship with many of the cases. The authors after demonstrating the hypersensitiveness of patients with *lupus erythematosus* to tuberculin compared with the normal individual, decided to continue their experiments by inoculating material collected during life into guinea pigs. A small piece of skin with some fat attached was removed from one of the active areas of the disease, ground in a mortar and finely emulsified in two cubic centimetres of

sterile, normal salt solution. One cubic centimetre was injected into the peritoneal cavity of a guinea pig. The animal was allowed to live three months before necropsy was performed. Tuberculosis was produced in five out of twenty-three guinea pigs by these means. Tuberculous nodules were found in the liver, spleen and glands whilst tubercle bacilli were demonstrated microscopically in the tissue in each case.

RADIOLOGY.

Diaphragm Lesions.

E. J. JENKINSON (*American Journal of Roentgenology*, July, 1925) refers to various lesions in the diaphragm which may give rise to symptoms. Normally there are three openings through which the aorta, the oesophagus and the *vena cava inferior* pass. Wounds of the diaphragm may cause a rent with subsequent protrusion of viscera into the thoracic cavity. In these cases there is usually no sac. In eventration the organ, for example the stomach, may be high in the thoracic cavity, but still remains below the diaphragm; in these cases the high position is due to paralysis of the diaphragm. Diaphragmatic hernia may be congenital or acquired and the stomach is most usually the displaced organ. Hernia is usually left sided. Symptoms are generally increased when the patient lies down, while in the upright position symptoms are relieved. A large meal is often followed by respiratory embarrassment. Cardiac disturbance and gurgling in the lower part of the chest at times occur. X ray examination must be made with the patient in the upright, recumbent and inverted positions.

Pulmonary Neoplasms.

PETER KERLEY writes on neoplasms of the lungs and bronchi (*British Journal of Radiology*, B.I.R. Section, September, 1925). Contrary to ordinary belief, it has been shown in a series of seventy-four cases reported by Otten that carcinoma is commoner than sarcoma. An accurate clinical picture cannot be given. When symptoms occur they are usually those of pneumonia, gangrene or abscess. The loss of weight is usually out of all proportion to the physical signs. Persistent cough is often a prominent sign, but is seldom complained of by the patient. Hemoptysis is frequent, but "prune-juice sputum" is rarely seen and cancer cells are never present in the sputum. Elastic fibres and fat globules are commonly seen, especially the latter. Swelling in the neck is a late sign and is due to pressure on the superior *vena cava*. Fever at night is not uncommon, while dyspnea is a late sign. Pleural effusion is a common complication. It is not possible to differentiate in

radiograms between benign and malignant growths as between carcinoma and sarcoma. The author points out various appearances, but emphasizes the difficulty in differentiation from chronic pneumonia and actinomycosis. Frequently the diaphragm is elevated on the affected side. The hilar form of malignant disease is uncommon and is difficult to differentiate from chronic tuberculosis. As a rule the increased hilar shadow is greater in carcinoma. Syphilitic lesions are uncommon, but must be excluded as the radiographic appearances are the same as malignant disease. Case reports, radiograms and drawings are included in this article.

Fluoroscopy in the Diagnosis of Ruptured Gastric and Duodenal Ulcer.

R. T. VAUGHAN and W. A. BRAUS (*Wiener Medizinische Wochenschrift*, August 15, 1925) maintain that free air in the peritoneal cavity was seen in thirteen out of fifteen cases of acute perforation of gastric ulcers. The patients were examined with the fluoroscope without any preparation and without the use of a contrast meal. Free air is an early sign frequently noted within two hours and occurs before the other symptoms have developed. The air manifests itself as a clear zone collecting in the uppermost regions of the peritoneal cavity depending on the posture of the patient. If fluid be present it is indicated by a straight horizontal line and a splashing movement can be noticed if the patient be shaken. The sign may be also noted after perforation of any part of the gastrointestinal tract. The earlier recognition of perforation will permit of earlier operation and so is an important factor in the improvement of the prognosis.

Radiographic Examination of the Chest Following Injection of "Lipiodol."

R. LEUK and F. HASLINGER (*Klinische Wochenschrift*, August 6, 1925) give the results of their work after passing a tube into the bronchi and injecting "Lipiodol." In normal chests the contrast material in the alveoli may form shadows which are difficult to differentiate from early bronchiectasis. The solution is soon coughed out of the bronchi, but remains for months in the alveoli until it is slowly absorbed.

Ventriculography.

J. SCHUSTER (*Klinische Wochenschrift*, October 22, 1925) states that ventriculography with "Lipiodol" and air is a safe procedure. Small tumours the size of a pigeon's egg can be easily diagnosed, whilst the use of the Potter Bucky diaphragm has made diffuse tumours, especially in the anterior lobe, more easily noted. Care must be taken not to mistake slight variations in the contour of the parietal and occipital lobes for pathological lesions. In cases in which

owing to stricture of the foramina of Luschka and Magendie very little air can pass into the lateral ventricles, "Lipiodol" can be injected directly into the ventricles without causing much disturbance to the patient.

Schlatter's Disease.

MAX EMMETT (*Journal of Radiology*, July, 1925) reports a case of so-called Schlatter's disease or *apophysitis tibiae*. The aetiology of this condition is not definitely settled. Schlatter considers it to be due to injury, while others regard it as inflammatory in origin. Twelve to fifteen year old boys are almost invariably affected and they complain merely of swelling and tenderness over the tibial tubercle with increase of pain on flexion. Radiograms reveal separation of the tubercle and it may be divided into several pieces. Treatment consists in immobilization in plaster for three or four months.

Radiotherapy of Tonsils.

W. L. ROSS contributes a paper on the X ray treatment of hypertrophied and infected tonsils (*Journal of Radiology*, July, 1925). In this field of treatment advantage is taken of the well known action of X rays on lymphoid tissue which can be destroyed in whole or in part without appreciable damage to the surrounding tissues. The treatment indicated is opening up the crypts and then applying X rays. The author employs the following technique: Spark gap twenty centimetres (eight inches), kilovoltage seventy-four, milliamperage five, filter six millimetres of aluminium, distance 32.5 centimetres (thirteen inches), time thirty to forty seconds. No unfavourable symptoms follow this form of treatment and it is quite painless. Uniform relief of symptoms follows treatment.

Dental Radiography.

FRANK COLYER (*British Journal of Radiology*, B.I.R. Section, October, 1925) writes on the use of radiography in the diagnosis of dental disease. Chronic general periodontitis (*pyorrhæa alveolaris*) follows on infection at the gingival margin when microorganisms gain lodgement with the decaying food *débris* and inflammatory processes extend to the alveolus causing absorption and destruction of the processes. Another valuable field in diagnosis is the report on the condition of the root apices as to whether they are absorbed and if absorbed, whether the outline of the tooth is regular or irregular. When the pulp of a tooth dies, the periodontal membrane may become infected. This may heal leaving no X ray evidence or the infection may proceed and the bone in the neighbourhood of the tooth will be destroyed and a granuloma result or even a collection of pus. Radiograms reveal well defined areas of bone absorption about the apex. Such areas may be inactive, but it is safer to advise extraction.

British Medical Association News.

NOTICE.

The following information has been received from the Deputy Medical Secretary of the British Medical Association.

Scholarships.

The Council of the British Medical Association is prepared to receive applications for research scholarships as follows:

The Ernest Hart Memorial Scholarship of the value of £200 *per annum* for the study of some subject in the department of State medicine.

Three research scholarships each of the value of £150 *per annum* for research into some subject relating to the causation, prevention or treatment of disease.

Each scholarship is tenable for one year, commencing on October 1, 1926. A scholar may be reappointed for not more than two additional terms. A scholar may hold a junior appointment at a university, medical school or hospital, provided that the duties of such appointment do not interfere with his work as a scholar.

Grants.

The Council of the British Medical Association is also prepared to receive applications for grants for the assistance of research into the causation, treatment or prevention of disease. Preference will be given, other things being equal, to members of the medical profession and to applicants who propose as subjects of investigation problems directly related to practical medicine.

A copy of the regulations relative to the award of the scholarships and grant for 1926-1927 and of the prescribed application form can be obtained on application to Dr. R. H. Todd, Honorary Secretary of the Federal Committee of the British Medical Association in Australia, B.M.A. Building, 30-34, Elizabeth Street, Sydney. The completed application form is required to be submitted not later than March 31, 1926. Applicants are required to furnish the names of three referees who are competent to speak as to their capacity for the research contemplated, to whom reference may be made.

NOMINATIONS AND ELECTIONS.

The undermentioned have been nominated for election as members of the New South Wales Branch of the British Medical Association:

Holt, John Ackland, M.B., Ch.M., 1925 (Univ. Sydney), Mental Hospital, Gladesville.

Lindow, Albert, M.R.C.S., 1886 (England), L.S.A., 1886 (London), D.P.H., R.C.P.S., 1895 (England), Elsie Street, Homebush.

Pearlman, Henry, M.B., 1925 (Univ. Sydney), Sofala, *via* Bathurst.

Shallard, Kenneth Boulton, M.B., Ch.M., 1924 (Univ. Sydney), Ocean Street, Bondi.

Proceedings of the Australian Medical Boards.

VICTORIA.

The undermentioned have been registered under the provisions of *The Medical Act 1915*, as duly qualified medical practitioners:

Fenton, Clyde Cornwall, M.B., B.S., 1925 (Univ. Melbourne), National Bank, St. Kilda.

McTeigue, Charles Joseph, M.B., B.S., 1925 (Univ. Melbourne), Fernhill Road, Sandringham.

Post-Graduate Work.

THE MELBOURNE PERMANENT COMMITTEE FOR POST-GRADUATE WORK.

THE MELBOURNE PERMANENT COMMITTEE FOR POST-GRADUATE WORK has arranged a series of short lectures to be delivered each Thursday afternoon at 4.30 from March 11 to May 13, 1926. The lectures are to last for three-quarters of an hour. They will be given at the Medical Society Hall, East Melbourne, and will be free of all members of the Victorian Branch of the British Medical Association.

The object of the weekly lectures is to assist the general practitioner in special problems which he may meet in his daily practice. If they prove to be successful, the Committee will arrange for a further series of ten lectures to be delivered after the termination of the first series.

The following is the syllabus and the names of the lecturers:

March 11, 1926.

DR. R. R. STAWELL: "Difficulties in Diagnosis."

March 18, 1926.

DR. E. W. FERGUSON: "Infantile Diarrhoea."

March 25, 1926.

MR. G. W. D. UPJOHN: "Diagnosis and Treatment of Injuries of the Elbow Joint."

April 1, 1926.

DR. MARK GARDNER: "First Aid in Eye Injuries."

April 8, 1926.

DR. R. WETTENHALL: "Common Skin Diseases."

April 15, 1926.

DR. FRANK ANDREW: "Earache and its Treatment."

April 22, 1926.

DR. J. R. BELL: "Management of a Case of Hæmatemesis."

April 29, 1926.

DR. D. G. ROBERTSON: "Difficulties in Diagnosis of Industrial Diseases."

May 6, 1926.

DR. L. S. LATHAM: "Diagnosis and Treatment of Early Pulmonary Tuberculosis."

May 13, 1926.

MR. ALLAN HAILES: "Infections of the Hand."

All communications concerning these lectures should be addressed to the Joint Honorary Secretaries, Dr. J. W. Dunbar Hooper and Dr. Harold Dew, 12, Collins Street, Melbourne.

COURSE IN TROPICAL HYGIENE.

ARRANGEMENTS are in hand by the Commonwealth Department of Health for initiating a course of training in tropical medicine and tropical hygiene for medical graduates at the Australian Institute of Tropical Medicine, Townsville.

Should a sufficient number of applicants be forthcoming, it is proposed to commence the course about May 1. It will extend over the ensuing twelve weeks, with an additional two weeks for examinations.

The subjects covered will include *inter alia* tropical medicine and hygiene, protozoology, helminthology, medical entomology, bacteriology, tropical pathology, immunity technique, tropical ophthalmology and demonstrations of various aspects of practical tropical sanitation. The theoretical part of the course will cover about 180 hours

and the practical part 150 hours of actual teaching and demonstration.

The Australian Institute of Tropical Medicine is very fully equipped with all facilities for the teaching of its special subjects and has available a very large amount of tropical pathological material in addition to an extensive library.

Medical graduates attending the course will receive a certificate covering such attendance. Those sitting for an examination in theory and practice at the close of the course will receive a further certificate stating the standard attained.

A fee of ten guineas will be charged to cover costs of the course. Applicants will be required to provide their own microscopes, but all other scientific material will be furnished by the Institute.

Townsville is in regular communication by rail and steamer with the Australian capitals. Steamer fares (first saloon) are as follows:

	Single.	Return.
Melbourne to Townsville	£16 5 0 ..	£32 10 0
Sydney to Townsville ..	12 0 0 ..	24 0 0
Brisbane to Townsville..	7 10 0 ..	15 0 0

Railway fares (first class) are available for two months, interstate; for three months from Brisbane:

	Single.	Return.
Melbourne to Townsville	£12 9 0 ..	£19 19 0
Sydney to Townsville ..	9 3 0 ..	14 9 0
Brisbane to Townsville..	4 19 0 ..	7 9 0

Hotel accommodation is available at Townsville at rates ranging from two guineas to four pounds ten shillings. Suitable boarding house accommodation or flats are difficult to obtain.

Intending applicants are requested to communicate with either the Acting Director, Division of Tropical Hygiene, Commonwealth Department of Health, Eagle Street, Brisbane, or the Acting Director, Australian Institute of Tropical Medicine, Townsville, North Queensland.

Research.

THE WILLIAM GIBSON RESEARCH SCHOLARSHIP FOR MEDICAL WOMEN.

MISS MAUD MARGARET GIBSON has placed in the hands of the Royal Society of Medicine a sum of money sufficient to provide a scholarship of the yearly value of £292 in memory of her father, the late Mr. William Gibson, of Melbourne. The scholarship is awarded from time to time by the Society to qualified medical women who are subjects of the British Empire and is tenable for a period of two years, but may in special circumstances be extended to a third year. The next award will be made in June, 1926.

In choosing a scholar the Society will be guided in its choice "either by research work already done by her or by research work which she contemplates. The scholar shall be free to travel at her own will for the purpose of the research she has undertaken."

There is no competitive examination nor need a thesis or other work for publication or otherwise be submitted. The Society has power at any time to terminate the grant if it has reason to be dissatisfied with the work or conduct of the scholar.

Applications should be accompanied by a statement of professional training, degrees or diplomas and of appointments together with a schedule of the proposed research. Applications must be accompanied by testimonials, one as to academical or professional status and one as to general character. Envelopes containing applications *et cetera* should be marked on top left hand corner "William Gibson Research Scholarship" and should be addressed to Mr. G. R. Edwards, Secretary, Royal Society of Medicine, 1, Wimpole Street, London, W.1, and be received not later than Tuesday, June 1, 1926.

Correspondence.

HELIO THERAPY.

SIR: Dr. Vickers in his remarks on heliotherapy referred to carefully regulated and graded doses of sunlight.

I do not think at low altitudes and in Victoria at all events we need to exercise the caution advised by Rollier. For ten years I have in Melbourne practised rapid exposure. The only case in which care is necessary, is the fair type of individual with a skin that blisters easily; even in winter, unless caution is taken, these individuals will blister. These should be exposed to air in the shade at the beginning and we must remember that direct sunlight though helpful is not necessary.

Yours, etc.,

W. KENT HUGHES.

22, Collins Street,
Melbourne, January 18, 1926.

LUMBAR PUNCTURE IN ACUTE PLUMBISM.

SIR: Your issue of January 2 contains a report from the Queensland Branch of the British Medical Association of the discussion on Dr. Lanes paper on workers' compensation insurance. May I ask you to publish this note in correction of a statement in it attributed to me?

I reminded the meeting that cases of acute ocular plumbism in children always showed increased intracranial pressure which was the cause of their papilledema and ophthalmoplegia. I did so that I might suggest to Dr. Lane that as he had opportunity of observing many cases of acute plumbism not associated with ocular symptoms, he might observe whether they also showed increased tension of cerebrospinal fluid on lumbar puncture; because if so, lumbar puncture would shorten treatment and relieve symptoms at present attributed to peripheral paralysis only. I am anxious that the beneficial effects of immediate lumbar puncture in the ocular lead cases should be recognized and acted upon as urgent treatment. To be made to assert, therefore, without personal experience in ordinary acute lead cases that increased intraspinal pressure would be found in them and was the cause of their peripheral neuritis, was most disconcerting. Dr. Lane was good enough to say that he would endeavour to obtain the evidence asked for.

Yours, etc.,

J. LOCKHART GIBSON.

Brisbane,
January 18, 1926.

THE MATTER OF FEES.

SIR: Following on correspondence in regard to charging and collection of fees, may I ask is it not an abuse of medical practice for patients to summon the ambulance, be taken to hospital, treated and later returned home by ambulance, when in a position to pay private medical fees?

I believe this to be a common practice among the general public.

Is there no regulation preventing the ambulance from attending any but urgent cases, unless called in by a medical practitioner?

If not, why not?

Perhaps the payment of a uniform cash fee of, say, 2s. 6d. or 5s., to ambulance funds by all cases removed under doctors' orders, might act as a check on enthusiastic ambulance bearers.

Regarding unpaid debts by patients well able to pay same, surely any legitimate means of obtaining legal redress for such lost fees is countenanced by the British Medical Association, otherwise the medical profession is the only one not protected in regard to recovery of fees for professional work.

Another source of considerable loss of fees to the medical profession lies in that not-by-any-means-rare section of the community who whilst comfortably off and even wealthy, deliberately mis-state their financial position or salary to be admitted and kept as members of lodge benefit societies.

Such are well known to most practising practitioners. Could not there be some arrangement whereby such became automatically declared outside the scope of lodge benefits when proved to be in receipt of anything over a certain salary *per annum*? Practitioners should all be able to add some names to a common list of offenders in this regard and secure their removal from all lodge lists forthwith.

In these and other matters I join with "Inquirer" and "Ch.M." in welcoming a comprehensive discussion or statement from the senior members of our profession, enabling us to safeguard ourselves from the inroads of those who deliberately make a cheap convenience of doctor, hospital and ambulance, without making any effort at reasonable payment for these services, although well able to do so if properly called upon.

Yours, etc.,

"YOUNG PRACTITIONER."

January 1, 1926.

DICHOTOMY.

SIR: In the Journal of January 16, 1926, "Surgeon" has put the whole thing clearly.

For my part I look upon it as a compliment to have a capable man undertake an operation for my patient and to be associated with such a man. It is very comforting to feel that "a specialist" will do what I have not trained myself to do. I should look upon it as mercenary if not dishonourable even to think of dividing fees with him and with this feeling in me I have my client's trust. I have found that my consultants will always meet me in the matter of fees and charge according to what I think is my client's ability to pay.

Yours, etc.,

"ONE OF THE OLD SCHOOL."

Victoria,

January 26, 1926.

CHRONIC ULCER OF THE LEG.

SIR: We must all admire the clear and graphic description of the conditions which Mr. Fay Maclure, O.B.E., declares to be essential to the integrity of the tissues of the lower extremities in particular and the closure of solution of continuity following the formation of a chronic ulcer.

He describes the ulcer as a leak in a vessel and then details his method of healing the breach.

I cannot refrain from offering some criticism of the technique in the first place in the interest of safety.

Mr. Maclure cannot rely upon every single individual following out his method of applying the leg case with exactitude. Some will vary the materials and their method of application. All innovators suffer in this regard.

There are a great many people, qualified and otherwise, who strap the leg to cure ulcers and I have a vivid recollection of a patient of mine who had quite a small ulcer, being attended by a quack. The leg was encased in plaster, became rapidly gangrenous, causing the death of the patient. This result can follow from septic agencies uncontrolled just as well as from pressure.

The question of sepsis is all important in varicose ulcer. The leak will persist, let us admit, for static reasons, but the spread of the ulcer and the pain result from sepsis.

Mr. Maclure mentions many reagents which favourably influence the course of healing by coagulating protein. "On the granulation tissue they produce a film of

coagulated serum" This layer or covering is the foundation of an artificial scab. Healing under a scab is the final stage in the process of repair. If an enduring scab form, Mr. Maclure admits that all the conditions requisite for the reestablishment of "pump action" exist.

It only remains then to adopt a procedure that will insure the formation of a scab, artificial or otherwise, to stop the "leak."

In my opinion this can safely be done by instituting and most obediently following the antiseptic technique of the late Lord Lister.

If this be done and ambulatory treatment alone is acceptable to the patient, it is only necessary to institute and most obediently follow the technique of Mr. Fay Maclure in applying the leg case. The *rationale* of the latter is most appropriately the subject of congratulation by all who read the paper under review.

Yours, etc.,

A. C. F. HALFORD.

Brisbane,

January 9, 1926.

SIR: I read with interest Mr. Maclure's article on chronic ulcer of the leg. His main treatment consisted in Unna's leg case. The varnish is sold to the public as a cure for varicose veins at a fancy price; I believe it is styled "Varix."

Lest any one be tempted into the application of this case to leg ulcers, I append another way of obtaining the same results in a far quicker and satisfactory way. It embodies the same therapeutic principles and costs far less. Briefly the treatment is as follows: A Martin's leg bandage of rubber is procured. At bedtime the ulcer and leg is washed with carbolic soap and a piece of lint soaked in the lotion and covered with protective placed over ulcer and leg bandaged with a cotton bandage from toe to above knee. Before rising in the morning and before putting the leg to the ground, wash the ulcer with carbolic lotion and apply the rubber bandage from the toe to above the knee, endeavouring to cover the ulcer with one turn of the bandage. No dressing must be put on ulcer, the rubber being applied direct on the ulcer. The patient goes about his work in the usual manner. If the discharge becomes frequent the bandage is removed, leg cleaned and bandage reapplied. The rubber bandage at night time is washed and hung up to dry.

Most ulcers heal readily, but some are refractory. The following paste should be applied in these cases: *Pasta Iodi et Angli* (U.C.H.).

If the ulcer is offensive, clean first with terebene and if painful, paint with "Anæsthetin," then fill ulcer with the paste and cover with lint on which the paste is spread.

I have found resinol ointment very useful in varicose ulcers.

I had discarded Unna's leg case over five years ago and have never had to use it for ulcers, but have found it of great use in eczema of leg.

In some cases the ulcer will not quite heal, but a small area the size of a threepence remains. I have found powdered camphor applied night and morning to effect rapid healing.

In a certain class of patients who will not submit to elastic pressure treatment, dilute precipitate ointment or 10% ichthylol ointment heals the ulcers.

Yours, etc.,

ARTHUR WATKINS.

Griffith, New South Wales,

January 12, 1926.

GONORRHOEA IN NEW GUINEA.

SIR: In the very interesting paper "Gonorrhœa in Natives of New Guinea" by Dr. Calov and Mr. Weir, there is no reference to stricture or salpingitis, although the authors

say: "Complications as epididymitis, arthritis and ophthalmia sometimes occur and when present may provide a clue to diagnosis." We know that primitive races suffer wounds and injuries with indifference to pain and discomfort, but salpingitis and the symptoms of stricture of the urethra would be hard to conceal. The high incidence of the disease amongst the natives leads one to expect some reference to these sequelæ or the cause of the absence of these sequelæ. Would Dr. Calov favour his readers with his opinion as to how the native of the Rabaul district appears to escape so lightly? Also if it is not trespassing too much on his time, would he mind expressing an opinion as to the cause of the urethritis and posterior urethritis of a non-gonococcal nature which is so prevalent amongst the natives to whom he refers?

In referring to the complications that have come under his notice Dr. Calov in two places mentions arthritis. Does this mean that the joint complications amongst the natives are the most prevalent? I must apologise for bombarding Dr. Calov with so many questions, but his paper is of such an interesting nature that the reader naturally wants to know why these differences occur in the native races and what light they might throw on the causation of the complications of gonorrhœa in general.

Yours, etc.,

W. A. T. LIND.

18, Walpole Street, Kew, Victoria.
December 29, 1925.

THE PRICKLY PEAR AND DIABETES.

SIR: I again wish to bring under your notice the action of the prickly pear leaf in diabetic conditions. In a series of about twenty cases in which I know of, the irritation symptoms which are such a source of annoyance to these cases, have been definitely cured. I gave an account in a recent letter which was published of the reduction in the amount of blood sugar. The alleviation of general symptoms due to this condition is really remarkable and from my observations, carried on during the last twelve months, I think that the medical profession ought to thoroughly and scientifically investigate its action. The method at present being used to extract the substance from the leaf (*Opuntia inermis*) is as follows: One pound of leaf. Remove prickles by rubbing with paper. Shred well with a fork. Sprinkle one tablespoonful of bicarbonate of soda; cover with a quart of cold water. Then let the decoction stand all night. Strain through a colander. Strain again through a sieve. Take one wineglass full a day three times a day before meals.

This mixture is unpleasant and slimy to take. If this substance could be extracted more scientifically it could probably be prepared in a way which would make it more pleasant to take. There is not the slightest doubt about its value.

Yours, etc.,

W. G. SHELLSHEAR.

Wallsend, New South Wales.
January 8, 1926.

THE TREATMENT OF CANCER BY LOW GRADE HEAT.

SIR: Our thanks are due to Dr. D. Kelly for drawing our attention to this aspect of cancer treatment.

A hasty search of the literature at my disposal revealed reports of similar series by Clark, D. C. Balfour and Percival Cole. Their conclusions resemble those of Dr. Kelly and Dr. Percy. The so-called "cold" cautery is specially recommended for cancers of the cervix—still local, but becoming inoperable.

I assume that 75% of failures urged Dr. Percy to employ radiation in an attempt to improve his results.

I am unable to get satisfactory details from what I read as to (i.) exact extent of the patient's condition, local and general, and (ii.) accurate information regarding the X ray technique. I feel, however, that the case for radiotherapy in cancer has not been adequately stated.

As one interested in physical agents in treatment I would like to draw attention to some aspects of the question of using radiation (radium and X rays) in treating cancer. It is granted that enthusiasm has overridden judgement in its use on many occasions with the result that we hear on all sides that deep therapy is a failure. In such circumstances advance cannot be expected. The present position has been brought about by several factors, the chief being (i.) an unwise selection of cases, (ii.) no standard of X ray or radium technique or dosage, (iii.) ignorance of the ultimate effects of the radiations.

The radiologist was not wholly to blame. Judging from cases I have seen referred for deep therapy it appeared that the idea was abroad that inoperability, recurrence and cachexia were among the indications for the treatment.

A serious setback was given to the method by attempts to achieve the miraculous by radiation in such cases.

It must also be admitted that the difficulties of estimating X ray dosage and the lack of knowledge of cellular physiology and pathology resulted in what amounted to "shot gun radiotherapy."

Still in this state of affairs, it is gratifying to learn that many eminent physicists and medical men are continuing their researches into the biological responses to radiation guided by the lessons of the past.

Opity in a recent paper reviews the results of his own and others' work. He noticed in experiments that treatment with diffuse X rays had a favourable effect in reducing cancers only up to a certain dose. He considers the effect therefore due to general cellular and humoral reactions.

The work of Carrel, Drew, Rhoda Erdmann and Murphy is used to support his contention that epithelium and connective tissue form a biological unit. Disturbances of balance in this unit accompany cancer invasion.

Radiation produces local and general tissue effects. When favourable, these effects appear to be an accentuation of the natural defences against cancer growth.

If this is to be the idea behind our plan of treatment the principles of X ray dosage must be altered and the idea of a "carcinoma" dose abandoned. Then techniques so regulated to get "their maximum effects only on the malignant cells" will not be persevered with and the normal cells instead of being severely damaged will be urged to do their share towards eradicating the neoplastic disease. X rays burns and damaged normal structures will still represent overdosage—they cannot be admitted as arguments against radiotherapy as a curative agent.

I realize that it is highly improbable that any treatment based on empiricism will be wholly successful in a disease of unknown origin. Heat in its various forms has attracted much attention in therapy in recent years and the use of a technique as outlined by Dr. Kelly appears to have an established place in cancer treatment. Our experience has been with diathermy and many of the advantages claimed by Dr. Kelly can be applied to the therapeutic use of the heat engendered in the tissues by the passage of high frequency currents.

It would be a pity if others followed Dr. Percy in his attitude to radiation therapy.

At present it seems that the best results generally would be obtained by a suitable variation of treatment depending on the nature of the neoplasm, its condition at time of treatment and its site. A combination of measures—medical, surgical and physical—would probably improve results. A period of genuine cooperation would help considerably to determine the merits or demerits of radiation in operable and inoperable cancer. At least the time has not arrived when radiation methods should be abandoned entirely.

Yours, etc.,

F. J. GWYNNE.

"Beanbah," Macquarie Street, Sydney.
January 9, 1926.

Congresses.

IMPERIAL CONGRESS OF THE ROYAL SANITARY INSTITUTE.

THE Secretary of the Victorian Branch of the British Medical Association is in receipt of a letter from the Public Health Department, 295, Queen Street, Melbourne, to the effect that the Royal Sanitary Institute intends to hold an Imperial Congress in London in July, 1926, and has asked the Government to appoint delegates.

The Minister would be glad to learn the names of any members who will be in London at the time of the holding of the Congress.

CORRIGENDUM.

OUR attention has been drawn to an error published under "Proceedings of the Australian Medical Boards" in our issue of January 23, 1926. Dr. Edward Thomas Philip Eames is stated to have gained the diploma of membership of the Royal College of Surgeons and that of Licentiate of the Royal College of Physicians in 1915. Our formation was taken from the *Victorian Government Gazette*. The date should be 1892.

Medical Appointments.

Dr. A. J. P. Chapman (B.M.A.) has been appointed Temporary Honorary Relieving Assistant Dermatologist at the Royal Alexandra Hospital for Children, Sydney.

Dr. A. J. Aspinall (B.M.A.) has been appointed a Medical Referee for the purposes of the *Commonwealth Workmen's Compensation Act 1912*.

Dr. Thomas Wilson (B.M.A.) has been appointed Medical Inspector of Seamen at Port Hedland, Western Australia.

Dr. Charles Trevor Turner (B.M.A.) has been appointed Honorary Assistant Surgeon at the Adelaide Hospital.

Dr. Edward Angus Johnson (B.M.A.) has been appointed Deputy Inspector-General of Hospitals, South Australia.

Books Received.

PSYCHOLOGY FOR NURSES: INTRODUCTORY LECTURES FOR NURSES UPON PSYCHOLOGY AND PSYCHO-ANALYSIS, by Mary Chadwick; 1925. London: William Heinemann (Medical Books), Limited. Crown 8vo., pp. 260. Price: 6s. net.

OPERATIVE CYSTOSCOPY, by E. Canny Ryall, F.R.C.S.; 1925. London: Henry Kimpton. Royal 4to., with 115 plates containing 670 illustrations. Price 70s. net.

CÆSAREAN SECTION: WITH A TABLE OF ONE HUNDRED AND TWENTY CASES, by Herbert R. Spencer, M.D., B.S., F.R.C.P.; 1925. London: John Bale, Sons and Danielsson, Limited. Demy 8vo., pp. 71, with illustrations. Price: 6s. net.

RADIOGRAPHY: A MANUAL OF X-RAY TECHNIQUE, INTERPRETATION AND THERAPY, by Charles D. Enfield, M.D., F.A.C.P.; 1925. Philadelphia: P. Blakiston's Son and Company. Imp. 8vo., pp. 306, with illustrations.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser," page xviii.

LAUNCESTON PUBLIC HOSPITAL: Surgeon Superintendent.

LAUNCESTON PUBLIC HOSPITAL: Junior Medical Officer.

COMMONWEALTH OF AUSTRALIA—ROYAL AUSTRALIAN NAVY: Vacancy for Medical Officer.

ALEXANDRIA MUNICIPALITY, EGYPT: Chief Bacteriologist.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30-34, Elizabeth Street, Sydney.	Australian Natives' Association, Ashfield and District Friendly Societies' Dispensary, Balmain United Friendly Societies' Dispensary, Friendly Society Lodges at Casino, Leichhardt and Petersham Dispensary, Manchester United Oddfellows' Medical Institute, Elizabeth Street, Sydney, Marrickville United Friendly Societies' Dispensary, North Sydney United Friendly Societies, People's Prudential Benefit Society, Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries, Australian Prudential Association Proprietary, Limited, Mutual National Provident Club, National Provident Association.
QUEENSLAND: Honorary Secretary B.M.A. Building, Adelaide Street, Brisbane.	Brisbane United Friendly Society Institute, Stannary Hills Hospital.
SOUTH AUSTRALIAN: Honorary Secretary, 12, North Terrace, Adelaide.	Contract Practice Appointments at Ceduna, Wudinna (Central Eyre's Peninsula), Murat Bay and other West Coast of South Australia Districts.
WESTERN AUSTRALIAN: Honorary Secretary, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Diary for the Month.

- FEB. 9.—Tasmanian Branch, B.M.A.: Branch.
- FEB. 9.—New South Wales Branch, B.M.A.: Ethics Committee.
- FEB. 11.—Victorian Branch, B.M.A.: Council.
- FEB. 16.—Tasmanian Branch, B.M.A.: Council.
- FEB. 16.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
- FEB. 23.—New South Wales Branch, B.M.A.: Medical Politics Committee.
- FEB. 24.—Victorian Branch, B.M.A.: Council.
- FEB. 25.—South Australian Branch, B.M.A.: Scientific Meeting.
- MAR. 2.—Tasmanian Branch, B.M.A.: Council.
- MAR. 2.—New South Wales Branch, B.M.A.: Ethics Committee.
- MAR. 3.—Victorian Branch, B.M.A.: Branch.
- MAR. 3.—Western Australian Branch, B.M.A.: Council.
- MAR. 4.—South Australian Branch, B.M.A.: Council.
- MAR. 5.—Queensland Branch, B.M.A.: Branch.
- MAR. 9.—Tasmanian Branch, B.M.A.: Branch.
- MAR. 9.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
- MAR. 11.—Victorian Branch, B.M.A.: Council.
- MAR. 12.—Queensland Branch, B.M.A.: Council.
- MAR. 15.—New South Wales Branch, B.M.A.: Organization and Science Committee.

Editorial Notices.

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